WORK

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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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SOME MOVABLE GARDEN FURNITURE.

BY ARTHUR YORKE.

MOVABLE GARDEN FURNITURE—A RUSTIC CHAIR—MATERIALS—A RUSTIC TABLE—VARNISHING AND PRESERVING GARDEN FURNITURE.

IN these days, when garden parties have so much usurped the place of the more substantial (and costly) hospitalities of our fathers, movable garden seats and garden tables have become matters of some importance. In nothing else can they be made in such good taste and keeping as in rustic work, and those who have a turn for garden carpentry will naturally wish to try their skill on them. Now, strongly as I advocate rustic work in general, I am obliged to own that, as regards movable seats, that style of work has not always been very successfully employed. Rustic chairs are too often neither sightly, comfortable, nor light for removal. In fixed seats, either for the summer-house or for the open air, we can do well in rustic work, but rarely in those which are not fixed. Larch, our best material, will not lend itself kindly to chair-making, and in crooked stuff it is a hard matter to get either an artistic design or a comfortable seat.

Still, since in a set of papers like the present the reader has a right to expect something of the kind, I have in Fig. 1 given a design for a movable seat in which an attempt has been made to unite comfort, and even in a small quantity of crooked stuff, it will not be hard to find three pieces of suitable growth; and of course their upper sides can be so trimmed as to make them correspond with tolerable accuracy.

Fig. 1 is not drawn to scale, but the dimensions of the chair are about 4 ft. long, 3 ft. high to top of back, and the actual seat 16 in. high, and the same in breadth.

Whether rough wood with its bark on or peeled wood should be used is much a question of taste; but, in any case, our favourite larch will not

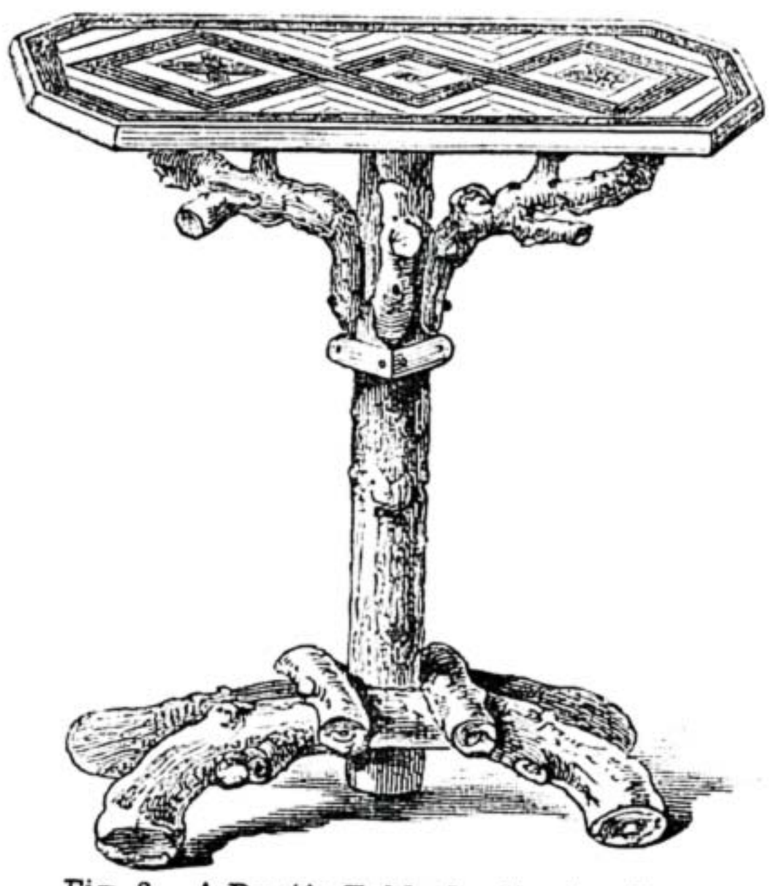

Fig. 3.—A Rustic Table for Garden Use.

appearance, and reasonable lightness. It is important, in such a piece of furniture as this, that there should be nothing that will hold water. A "gridiron" arrangement of the seat—one, that is, of sticks only—is much to be preferred to one of continuous board; and this point has been kept in view in the present example. Much of the back and ends will be seen to be formed of crooked stuff. It is likely that in the material at the disposal of the worker, he may be unable to find pieces which will very exactly tally with the curves given, for the growth of branches is highly eccentric. He must, therefore, rather look upon the drawing as suggestive than as a plan to be closely followed. His best chance of keeping near to it will, of course, lie in having a good quantity of stuff from which to select. The three pieces which support the rods forming the actual seat are, for the sake of comfort, of the form shown in Fig. 2. Such curves are frequent,

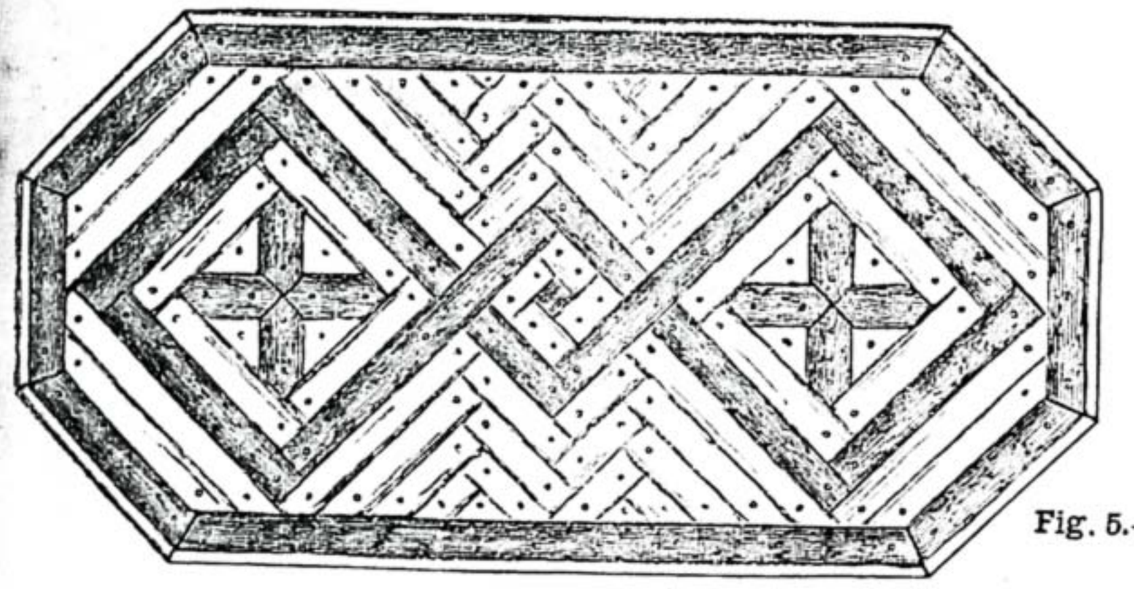

Fig. 5.—Top of Table in Rustic Mosaic Work.

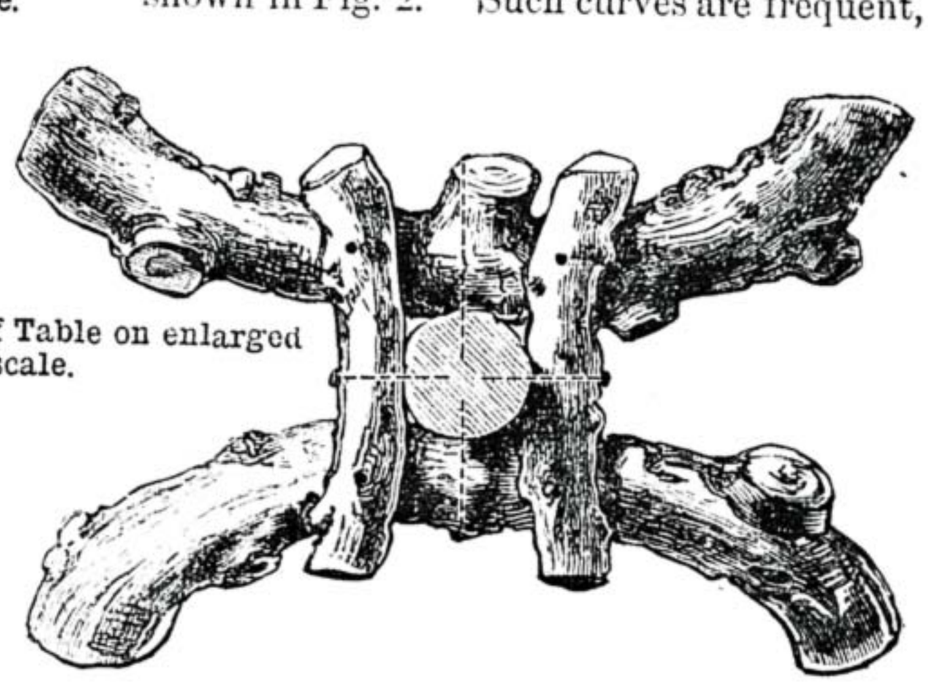

Fig. 4.—Foot of Table on enlarged scale.

Fig. 2.—A Support of the Seat.

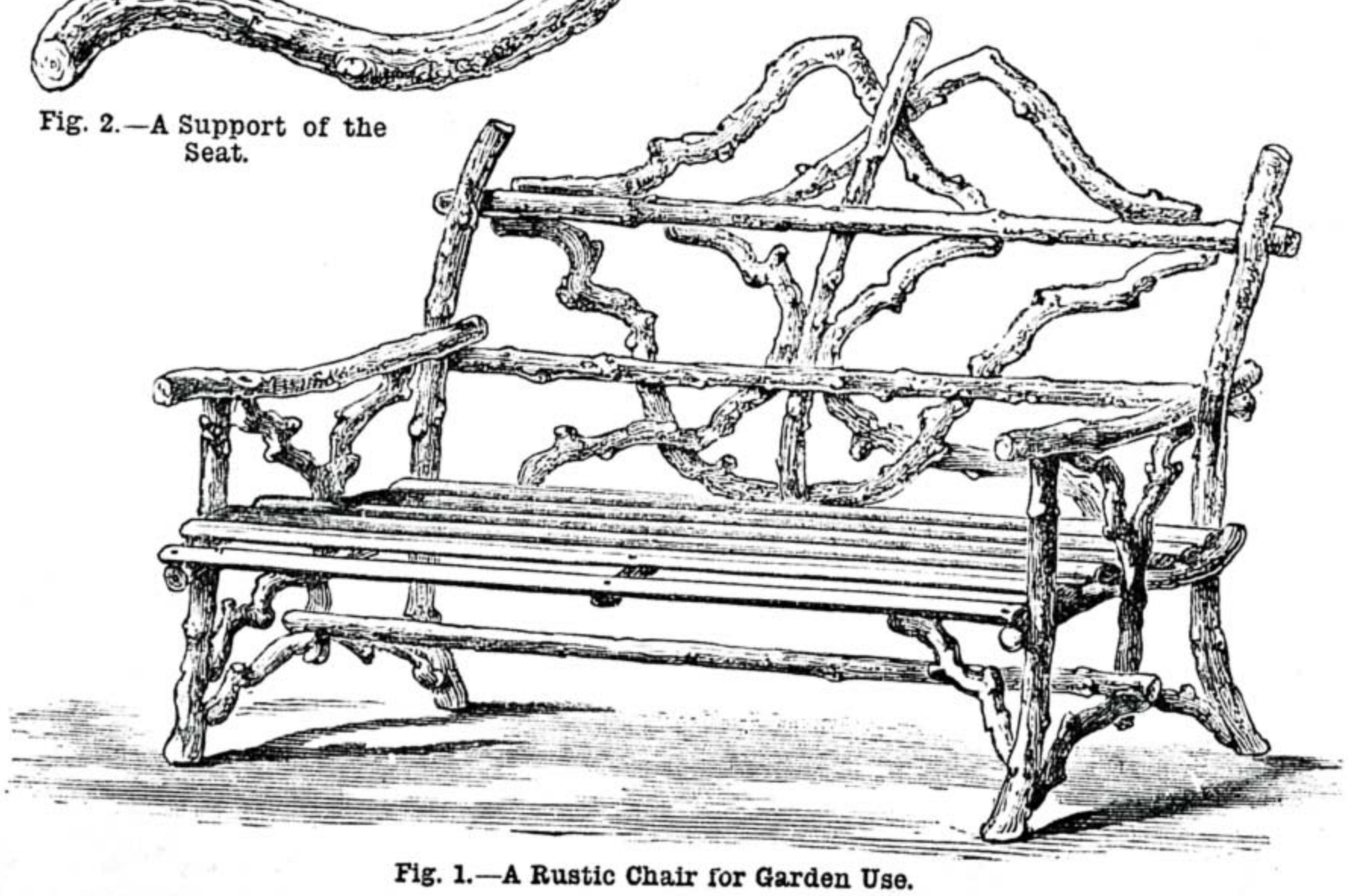

Fig. 1.—A Rustic Chair for Garden Use.

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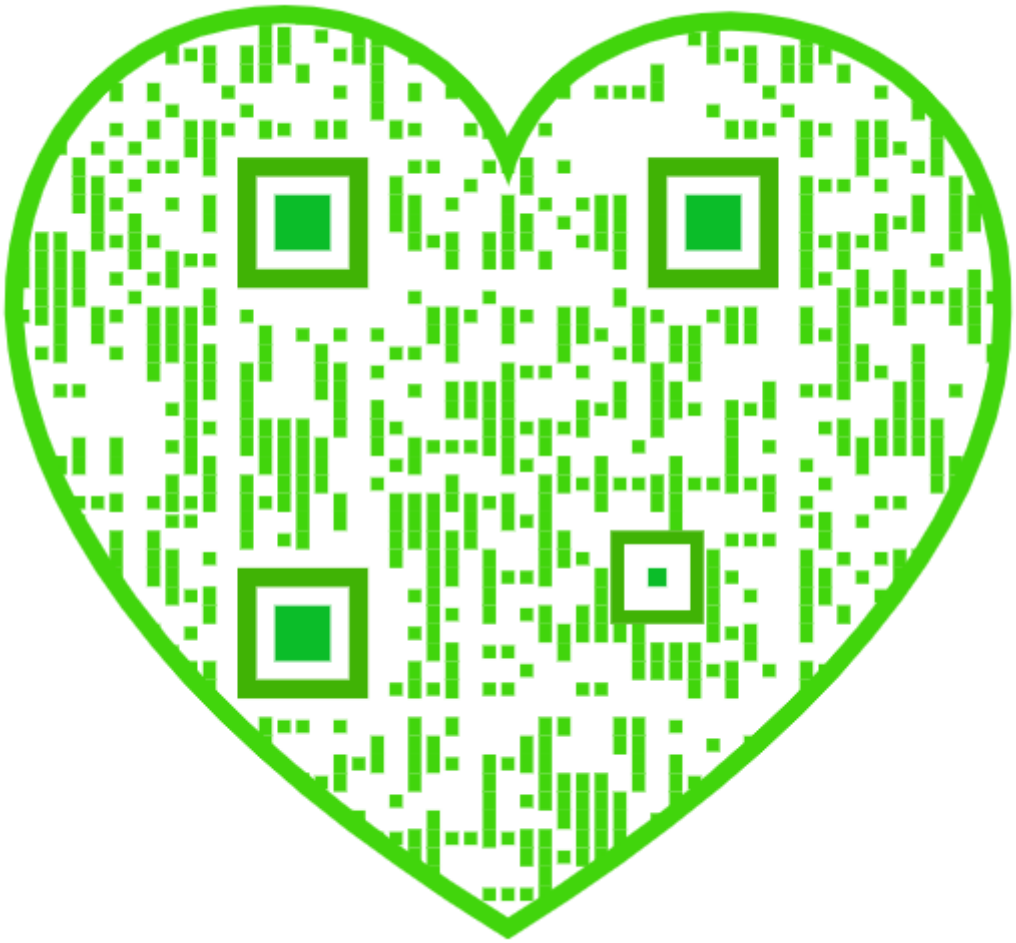

be suitable for any part of the work. If white peeled wood is preferred—and this will make the lightest chair—it will be well to use withy for the straighter parts of the frame; also for the seat, which should be of withy rods 1 in. or so in thickness, or, if they are used split, somewhat thicker. The crooked parts would then be of peeled oak bangles. Should, however, wood with its natural bark be chosen, nothing will be better for the straighter parts than small elm saplings, except for the seat, where springy hazel rods should be used. Elm or apple-tree branches will in this case serve for the crooked work.

The carpentry, as shown by the illustration, is of the most simple kind. There are no mortises, all the pieces being merely nailed together.

To produce satisfactory garden tables is a much more easy matter. In Fig. 3, we have a movable rustic table of a size to be readily lifted from place to place, though so far solid in its lower part as not to be easily upset, which is a point of importance. The perspective view of this in Fig. 3 is not drawn to any exact scale, but it will be found close upon $\frac{1}{2}$ in. to the foot. The dimensions are:—Height, 2 ft. 2 in.; length of top, 2 ft. 2 in.; breadth of top, 1 ft. 1 in.

The pillar, which forms rather an important feature in this table, cannot be made of anything more suitable or better looking than a piece of elm sapling. I mentioned this wood above as good for some parts of our rustic chair. In some districts where elms abound, such wood is easily to be got, the young elms springing up so thickly in the hedgerows that the majority have to be thinned out to allow the others to grow into timber. These young elms have commonly a very ornamental bark—the young wych elm in particular is frequently almost as picturesque in appearance as virgin cork. The piece required will be 1 ft. 11 in. long, and should be about $3\frac{1}{2}$ in. in thickness.

The foot, which appears in plan (from above) in Fig. 4, is made of four pieces of rough, crooked stuff, the two larger ones not quite so thick as the pillar, but still sufficiently heavy to give the table a solid foundation. These larger pieces are 21 in. long, and the shorter ones about 10 in. Probably, no difficulty will be found in meeting with pieces of the curve shown; the curved side, it will be seen, is placed downwards and outwards, so as to ensure as firm a standing to the table as can be attained. In the upper and smaller pair, the curved form is only chosen because straight pieces would not look nearly so well. The illustration (Fig. 4) shows the foot-pieces to be fastened to the pillar and to each other with large nails.

These pieces are drawn as of rough and knotted apple-tree wood, which of all others will be the most solid and the most picturesque for the purpose. Failing this, elm would do, or oak still better, provided sticks of the size can be found with the bark on. For the struts, it will not be difficult to find suitable branches, which, whilst they may differ, perhaps, in their details from those in the drawing and from each other, will yet in a general way agree with both, and give to the eye that satisfaction which arises from symmetry.

The top (26 in. by 13 in.) should be of 1 in. board, and as a safeguard against warping should have a couple of cross-ledgers screwed below. The ends of the struts should be let into mortise holes in these ledgers and firmly fixed there with screws. It is desirable that the struts should be well secured, so that no play of the top may be possible, for the foot is tolerably heavy, and when the table is lifted it is pretty certain to be by its top.

The upper surface, with its decorations of rustic mosaic, is shown to scale in Fig. 5. This kind of work has been fully dealt with in a former article. The dark bands in the present example are supposed to be of split hazel rods, and the filling-up between of peeled withy. The strip running round the edge of the table is also of the latter. Figs. 4 and 5 are drawn to a $\frac{3}{4}$ in. scale.

With a view to its proper preservation, our garden furniture should have a coating of inexpensive oak varnish, and an occasional revarnishing will be desirable. Movable seats, such as that in the design, will, of course, be housed during the winter, but through the summer the chances are that they will be left altogether exposed. The chair I have described is so made as to suffer very little from such exposure; the table, however, is an article which should be put under cover when not in use. A mere wetting will not hurt it, but if left so that the rain water can stand on its top, the bark will, notwithstanding varnish, crack and peel off, and the wood decay.

HINTS FOR WATCH WEARERS, AMATEURS, AND OTHERS.

BY HERR SPRING.

I PROPOSE to write some plain and simple facts about timekeepers, which may prove of service to the readers of this journal, and, through them, to the public at large.

The machinery of a watch is not unlike that of the human body. Every one knows some little about a watch, but only a specialist understands its inner workings, and even he, like a doctor, is often deceived in his diagnosis. Many simple rules have been laid down for the regulation of the human body, but very little is known as to the proper means of preserving the watch in the best working order. But there is no valid reason why much more may not be done by the general public, and particularly by the amateur mechanic, to increase the accuracy and usefulness of watches.

It cannot be said that such increased usefulness would be unworthy of some effort, for a moment's thought enables one to realise that watches and timekeepers of every kind are among the chief factors of modern life and civilisation.

A stranger going along a thoroughfare will often observe some peculiar object which has never been detected by a person who has passed and repassed the spot for half a generation, the simple explanation being that familiarity has blunted his sense of perception. It is much the same as regards timekeepers, which play such a wonderful part in the high-pressure life of the nineteenth century, and are so familiar to us that we rarely give them a passing thought. But only imagine the world awakening to-morrow morning to find all the timekeepers at a standstill, or all the wearers of watches reduced to the necessity of carrying in their pockets the watches worn in the days of their grandfathers. What confusion such an idea suggests in this age of lightning express trains and telegraphs!

In a less degree the inaccuracies of modern watches, small comparatively though they be, must have an influence not to be lightly under-estimated when we come to count the wearers by millions; and to assist in diminishing those inaccuracies is the object of the present writer.

The first point which a wearer must always steadily bear in mind is that a watch must be cleaned at least every eighteen months. This is of vital importance, not only for the purpose of good timekeeping, but also to preserve the machinery in proper order. But obvious as this is to those skilled in the art of horology, it is one of the points most frequently disregarded by wearers.

People often imagine that this advice is merely a plot hatched by watchmakers for their own benefit, and that so long as a watch seems to be keeping good time there is no reason why it should be interfered with; and in this we encounter the most widespread and most hurtful heresy indulged in by the public. Most people believe, and strenuously maintain, that a watch which has been lying in a drawer carefully wrapped up for years cannot possibly be dirty, ought to go when wound up as well as on the day when it was laid by, and cannot, on any account, be in need of cleaning.

But the simplest rudimentary knowledge of the true fact would cause this foolish idea to be dismissed for ever.

It is a fundamental principle that the oil with which the pivots are lubricated is of the same importance to a watch that food is to the human body. No food has yet been discovered that will sustain the body beyond a very limited period, and no oil has been found which will endure beyond an average period of eighteen months. In other words, oil plays a large part and dirt only a small part in the working of a watch, and, therefore, the very moment that the oil thickens, evaporates, or becomes absorbed, every bearing in the watch begins to cut and grind, and more damage may be done in a few days when the watch is in this condition than might be effected in twenty years were the oil in a pure and fluid condition, and in sufficient quantity.

An idea which cannot be considered irrational among the uninformed is that when a watch comes out of the hands of the watchmaker and in good order, it ought not to be interfered with until it comes to a standstill—then it requires cleaning. No idea could be more damaging. Apply the same theory to such a coarse article as a mangling machine, and the result is ruinous. Oil the mangling machine at the outset, and then use it till it becomes more and more difficult to turn the handle, and at last it is impossible to move it. Then take the machine to pieces, and you will find that every day's wear in this condition has done more injury than a year's legitimate use with clean oil.

My argument, of course, does not apply to exceptional cases. Instances have come under my notice often enough where a watch has been going for many years without cleaning or re-oiling, and yet with no perceptible injury to the pivots.

But these cases are quite out of the common, and are due to a remarkable combination of favourable circumstances, which could not be relied on for working purposes. No watch oil has been discovered that will, on an average, retain its virtue and remain intact for over eighteen months. There are two reasons for this. First, there is the native quality of the oil, and second, the minute quantity which is used for the lubrication of watches. And one may here add, the exceptional cases cut both ways. There are some oils which, in unfavourable conditions, will not last six months.

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There are probably few watchmakers who are thoughtful mechanics who have not experimented in the making of oil for their own use, but it must be confessed that there are few who have even approached that horological elixir of life—a pure oil. In fact, most of the experiments are mere fads, and many of them little less than superstitions. It would be tedious and fruitless for me to mention the various schemes for the making of watch oil which have come within my own observation, and I shall be doing something more to the purpose by naming the kind of oil used by two distinguished watch manufacturers of vast experience and skill. And here I may add that the precise results from the use of various kinds of oil are naturally the more easily detected by makers of the highest classes of watches, like the two gentlemen referred to above. When very high class watches are under the careful and constant observation of the maker for many weeks before they are turned out of his hands, and when the smallest vagary or error is noted and the cause searched for, it is obvious that the oil comes in for more examination than it does under any other circumstance.

There are two makes of watch oil sold by material dealers, which have steadily held their own for many years: viz., Roberts' and Ezra Kelly's oil. Roberts' oil is derived from vegetable, and is made in France; Kelly's oil is from fish, and is produced in the United States. But although these two oils are perhaps the best which have ever been sold, each one has a fault. The great desideratum is an oil which is thin enough to perform its functions, and yet thick enough not to run away from the chamfer into which it has been dropped by the watchmaker. That desideratum has been found, perhaps as nearly as it is ever likely to be found, in the mixing together of the two oils named, great care being taken to shake them well together.

But as regards the endurance of the oil in a watch, a large allowance must be made for individual peculiarities. There are many influences which affect a watch in all manner of ways, and are yet almost unrecognised. The business of the wearer is no small influence. To take an extreme case, a flour dealer would in most cases be at a great disadvantage, for the fine dust in the atmosphere in which he carries on his business would, in a greater or less degree, find its way into the works of his watch and absorb the oil.

Constitutional peculiarities, which are seldom recognised, have an influence on watches. The general character of diet and the exhumations of the body seem to affect both the oil and the going of watches. Any one who knows how thoroughly an Italian is able to saturate himself with garlic will understand the kind of bodily atmosphere which may surround a watch.

In an exact sense, therefore, every watch wearer is, more or less, a law unto himself; and, to return to the human analogy with which I started, the saying that every man is a fool or a physician at forty applies in a mild way to the wearer of watches.

So much, then, for the present, and, as the letter-writers sometimes say, more next time. It may be said that my paper, as it does not deal with construction or decoration, is not exactly suitable for the pages of WORK. But the next best thing to be done after making an article, or buying it, is to show how the possessor may best take care of it, and judged by this criterion I do not think my paper will be found a failure.

HOW TO MAKE A USEFUL AND CHEAP CHILD'S CHAIR.

BY "OUTIS."

My object in this paper being to enable unskilled amateurs to make a cheap and useful article of nursery furniture, I shall not offend the practical reader by a long and wordy introduction.

Suffice it to say that the history of my modest manufacture is simply this. I possess one American-made child's chair, for which I paid 28s. I also possess two little children, who cannot both occupy the same chair at the same time. My purse is but a slenderly lined one. The American chair was too stiff a job for an amateur like myself to copy, and too dear to buy a duplicate of it.

So I designed and made a chair which combines cheapness and utility, elegance and durability, and which cost me when finished only about 5s.

Having thus explained why I made my chair, let me describe more fully how I made it. Professional workmen, pray forbear to criticise too severely. The writer humbly confesses that he is "only an amateur," and writes only for the benefit of amateurs; although the design shown in the accompanying illustrations may possibly be useful to others also.

First of all, I made a rough sketch of my idea, the length of the various parts of the chair having to be suited to the capacity of a small "Prize Demas" lathe. Next—and most important step—I made a full-sized working drawing, showing every detail of construction. And now all was ready for a beginning.

In the accompanying illustrations, Fig. 1 shows a front view of the chair, or rather, strictly speaking, of the combined chair-table; Fig. 2 gives a side view; Figs. 3, 4, and 5, respectively, illustrate the shape and sizes of the chair seat, back, and step.

To begin with the table, or lower part. First, I procured a piece of well-seasoned wood, 14 in. square by 1 in. thick, and planed this all over, taking pains to make the sides and ends true and square. Then I drew light pencil lines from corner to corner of the square, and marked off from the centre (where the lines crossed each other) exactly 8½ in. along each diagonal line for the centres of the legs. With a $\frac{5}{16}$ in. centre-bit, a hole was then bored in the middle of the square to allow the screw A to be easily inserted and withdrawn. With a 1½ centre-bit, another hole was made at each corner of the square, ½ of an inch deep, to prevent the bottom of the chair legs from slipping when screwed to the table. Then, using these same four centres, with a 1 in. centre-bit, I bored right through the wood to receive the tops of the table legs. Having cleaned the surfaces with sand-paper, a beading 1¼ in. deep by ¼ in. thick, half-round at the top, was mitred and fixed along the sides and ends of the square flush with the bottom. Picture-frame nails, otherwise brads, 1 in. long, were used for the purpose, the heads being punched a little below the surface of the beading, and the holes filled up with putty. The table top was now complete.

For the legs of the table, four pieces of wood, about 16 in. long by 1⅝ in. square, were needed. My first care here was to turn that part of the leg which was to be fitted in the 1 in. hole in the table top, so as to ensure a tight fit. I began, therefore, by turning this at the end of the wood next to the loose headstock of the lathe, so that it could be removed and tried in the hole before finishing the rest of the leg. This done, the length of the leg, 14 in., was carefully marked off from the shoulder, and the leg finished according to pattern; a light line being set off 5½ in. from the bottom of the leg, and another 3 in. above this for the respective centres of the holes to receive the cross bars as shown in the illustration. The leg was then cut off and removed from the lathe, and the holes referred to bored with a ⅝ in. bit, at right angles to each other about half-way through the wood.

Having turned four legs exactly the same size in every respect, the crossbars (of which there are six alike, four in the table and two in the chair, at the sides) were next made out of wood 13 in. long by 1 in. square, turned to the right length and shape, and accurately fitted to the holes bored for them in the legs.

The whole table was then fitted together with hot and strong glue, the various joints being made doubly firm by driving in small nails—at an angle—from the inner side, so as not to be seen.

In constructing the chair proper, the same method was followed as in the case of the table just described. The only parts of the chair, therefore, which seem to require special mention are the seat, back, and step, shown in Figs. 3, 4, and 5. It should, however, be particularly noticed that the two front legs and supports for the arms are made all in one piece, the seat being slipped over the top, and resting on the shoulders, *a a*. The back legs also project through the seat (into which they must be tightly fitted), terminating at the top in a neatly turned ball as shown in the drawing.

Let us begin again with the seat (Fig. 3). For this is needed a piece of sound wood, even-grained and free from knots, 14½ in. square by 1 in. thick.

Having planed your wood, set out the centres for the legs exactly as described in the case of the table top. Then, from these centres, mark out with compasses the rounded corners as shown in the sketch. Next, describe the curve at back of seat. This can be done by using a thin piece of wood sufficiently long, fixed at one end with a pin or round nail, and fitted at the other end with a short pencil. At a distance of 1 in. inside of this curve, make another on which to set out the holes to receive bars connecting seat to back.

Mark position of centres of these holes. Join together the arcs at front and end of seat, and mark off the shape at the front as shown in the drawing. You can then set to work to bore the holes, and cut out your design. The chief difficulties here, I found, were in boring the ⅝ in. holes at the proper angle, and in hollowing out the seat to add to the comfort of the sitter. The former difficulty can be got over with a little care; but some amateurs may find it better to get the help of a joiner.

To overcome the latter difficulty, not possessing a compass plane, I set out with my compasses a circle of 10 in. diameter in the centre of the seat; and, with a rather flat inside gouge, carefully cut the required hollow (about ¼ in. deep in the centre), working on the slope from the circumference of the circle towards its centre, and finally finishing off with coarse and fine sand-paper alternately.

The outside of the seat was then shaped out with chisel, gouge, and spokeshave, and made smooth and even with sand-paper.

For the chair back (Fig. 4), take a piece

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of even-grained wood, 14 in. long by 2½ in. deep and 2 in. thick. Plane up quite true, and mark off a centre-line all round the four sides. Set the wood on its bottom face, and mark a pencil outline of it on the bench, with centre-line projecting at each side. Then set out curved lines at the required radius (see sketch) on the top of the wood. Reverse the wood, place accurately in position again on bench, and set out curves same as before, with an extra one midway between the outer two for centres of holes to receive bars joining back to seat. Mark centres of these holes as shown, and carefully bore (or get a joiner to bore) the holes to the required depth at the proper angle.

arms, to prevent a child falling out, should be made of tough, hard wood, with a head at one end and a screwed wooden nut at the other.

I did not fit one to my chair, but it will be safer to do so. If thought necessary, projecting feet can also be fitted to bottom of back legs of table, so that the chair cannot be tipped backwards.

The screw at A is of the kind sometimes fitted in small window frames, and can be bought at any ironmonger's. The bar to which it is fitted is flattened on top to receive brass screw plate. The corresponding screwed plate is fitted to underside of table top. Of course,

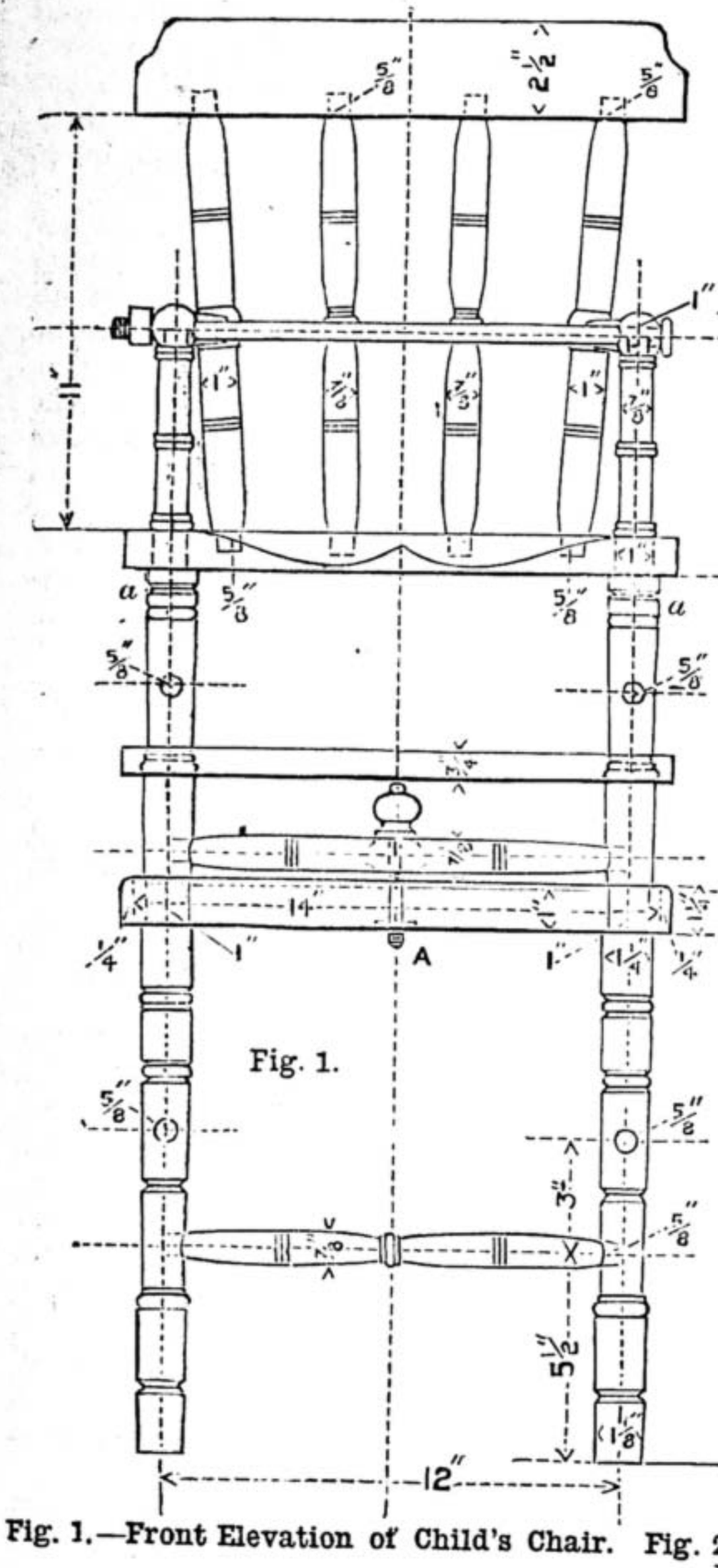

Fig. 1.

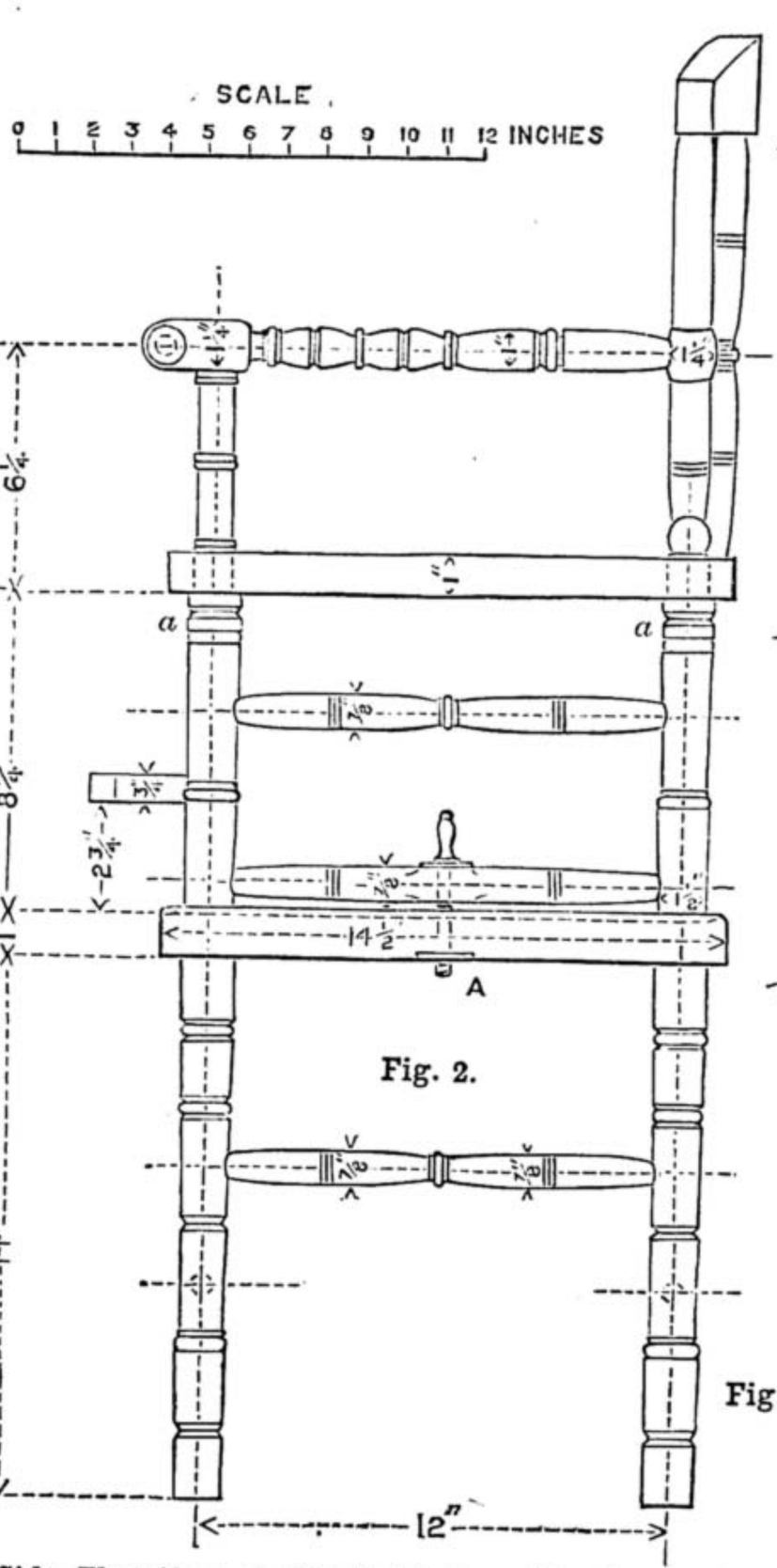

Fig. 2.

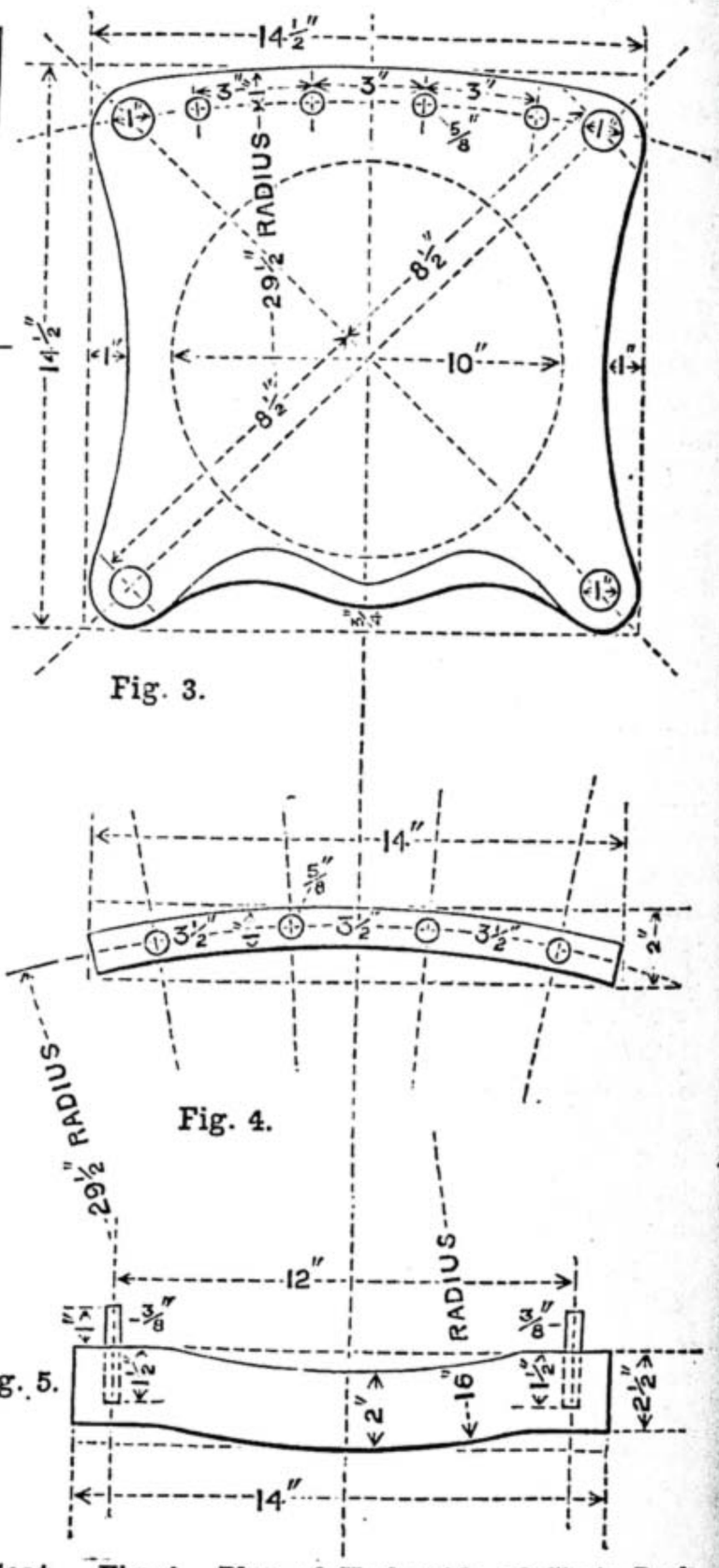

Fig. 3.

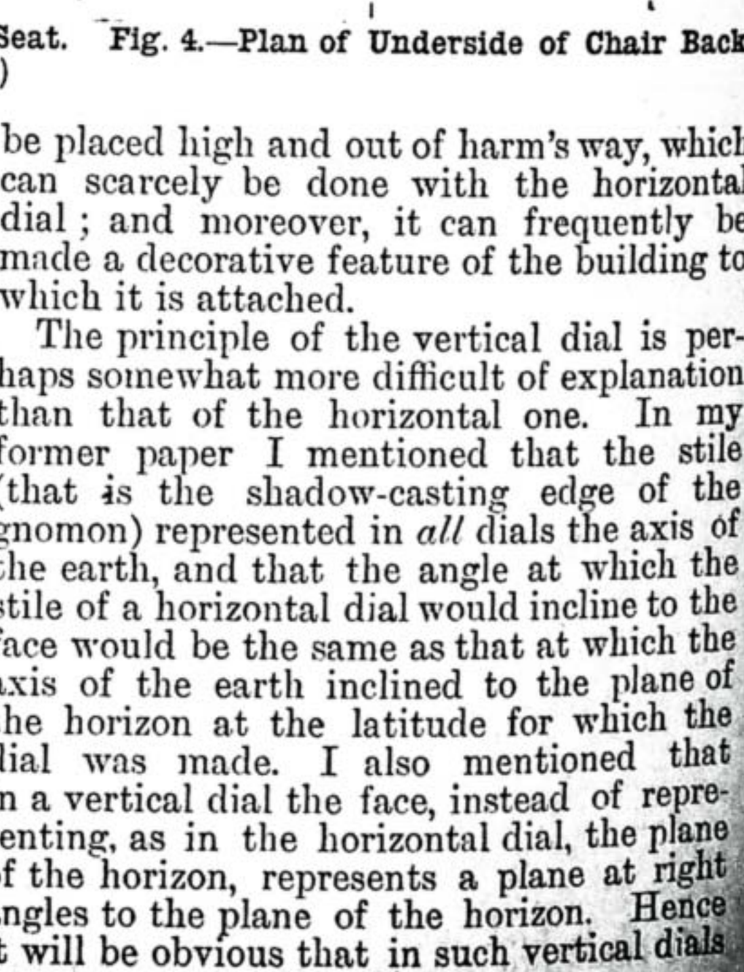

Fig. 4.

Fig. 5.

Fig. 1.—Front Elevation of Child's Chair. Fig. 2.—Side Elevation of Child's Chair. Fig. 3.—Chair Seat. Fig. 4.—Plan of Underside of Chair Back. Fig. 5.—Chair Step. (Scale throughout, 1½ in. to 1 ft.)

Then with chisel, gouge, and spokeshave shape your chair back according to drawing.

For the step (Fig. 5), a piece of wood, 14 in. long by 2½ in. wide by 3¼ in. thick, will be wanted. The construction of this is simple, and requires no explanation beyond that given in the drawing. To fit the step to the front legs of the chair, however, so as to make a good strong job, requires great care. Before planing your wood, place it edge upwards in the bench screw, and mark off two centres, 12 in. apart, exactly in the middle of thickness of wood.

Bore with ⅜ in. worm-bit two holes 1½ in. deep, to correspond with similar holes in front legs of chair (which should be bored nearly through the legs). Then turn two pins of the required size—of tough, hard wood—and, when your step is shaped and finished, fit tightly with good hot glue in position.

Only one or two general remarks are now needed, perhaps. The bar at front of chair all the parts of the chair must be fitted and secured with great care; but especial care should be taken to secure the arms to the two back upright bars.

I may just add that my chair, after twelve months' regular use, is as steady and strong to-day as when first constructed. It was made of yellow pine throughout, stained and varnished to resemble mahogany.

For those who have no lathe, the cheapest and best plan of constructing a similar chair-table may be to procure and adapt some of the turned patterns referred to in WORK, Vol. I., page 338. It must be borne in mind, nevertheless, that as these are intended to serve as the legs of washstands, balusters, etc., it is manifest that there will be considerable difficulty in picking out patterns that will suit in every way the exigences of a child's chair, whose legs after all are of a make peculiar to itself.

VERTICAL SUN-DIALS.

BY ARTHUR YORKE.

NORTH AND SOUTH DIALS.

ADVANTAGES OF VERTICAL DIALS—THEIR PRINCIPLES—SETTING OUT A VERTICAL SOUTH DIAL—SETTING OUT A VERTICAL NORTH DIAL.

ALTHOUGH the horizontal dial is the most comprehensive, telling the time for the greatest number of hours, in other respects the advantages are rather on the side of the vertical dial. The latter needs no pedestal, since it can generally be affixed to a wall; it can be made more conspicuous, and therefore by inference more useful; it can be placed high and out of harm's way, which can scarcely be done with the horizontal dial; and moreover, it can frequently be made a decorative feature of the building to which it is attached.

The principle of the vertical dial is perhaps somewhat more difficult of explanation than that of the horizontal one. In my former paper I mentioned that the stile (that is the shadow-casting edge of the gnomon) represented in *all* dials the axis of the earth, and that the angle at which the stile of a horizontal dial would incline to the face would be the same as that at which the axis of the earth inclined to the plane of the horizon at the latitude for which the dial was made. I also mentioned that in a vertical dial the face, instead of representing, as in the horizontal dial, the plane of the horizon, represents a plane at right angles to the plane of the horizon. Hence it will be obvious that in such vertical dials

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as are made to face due south or north, the angle at which the stile inclines will not be an angle equal to the latitude of the place, but one equal to the complement of that angle—that is to say, the angle will be of as many degrees as will with the latitude make an angle of 90°, which is a right angle. This may be more readily understood by reference to Fig. 1, which is supposed to show a portion of the earth, N S being the axis, whilst E represents the equator, and A B a line parallel to the axis; *c d* represents the plane of the horizon 34° north; the angle at *d* is therefore an angle of 34°, and would give the elevation of a stile for a horizontal dial for that latitude; *e f* represents the edge of a plane perpendicular to *c d*, and may therefore be said to represent, edgewise, the face of a vertical south dial for latitude 34°. This, it will be observed, makes at *f* an angle with the axis of 56°; 56° added to 34° make 90°, or a right angle: 56° is therefore the complement of 34°, and is the correct angle of elevation for the stile of a vertical south dial for latitude 34°. For London (51½°), the elevation would of course be 38½°; for Edinburgh (56°), it would be 34°.

To set out a *vertical south dial* we may proceed in the manner directed for setting out a horizontal dial, but making this difference—instead of setting off on the 6 o'clock line the angle of the latitude, we must set off the complement of that angle. The reader is asked to refer to Fig. 2 in my article on the *horizontal dial* (see page 17), and he will there see that the angle set off is one of 56° for Edinburgh. Had the proposed dial been a vertical one, the angle set off would have been one of 34°.

A method, however, more frequently employed by diallists is that exemplified in Fig. 2 of the present article. A meridian, A B, is first drawn, and cutting this at right angles, a second line, C, which will be the 6 o'clock line. Then, at any convenient point on the meridian, as at *d*, a perpendicular is raised, and a line drawn from C, forming with C *d* an angle equal to the complement of the latitude of the place cutting *d* in *e*. Then from *e*, and at right angles with C *e*, another line is drawn cutting the meridian at *f*. At *f*, the line, *g h*, is then drawn, cutting the meridian at right angles. Taking *f e* in the compasses, we mark off *f i* equal to *f e*, and with *i* as a centre and *i f* as radius, we describe a quarter of a circle, *f k*. This quadrant has to be divided into six equal parts, at 1, 2, 3, 4, 5, and through these points lines are drawn from *i* till they cut *g h*. Through the points thus gained on *g h*, lines are drawn from C to the outside of the paper, and these will be the hour lines for one-half of the day. If we transfer these lines to the opposite side, we shall have the whole dial required.

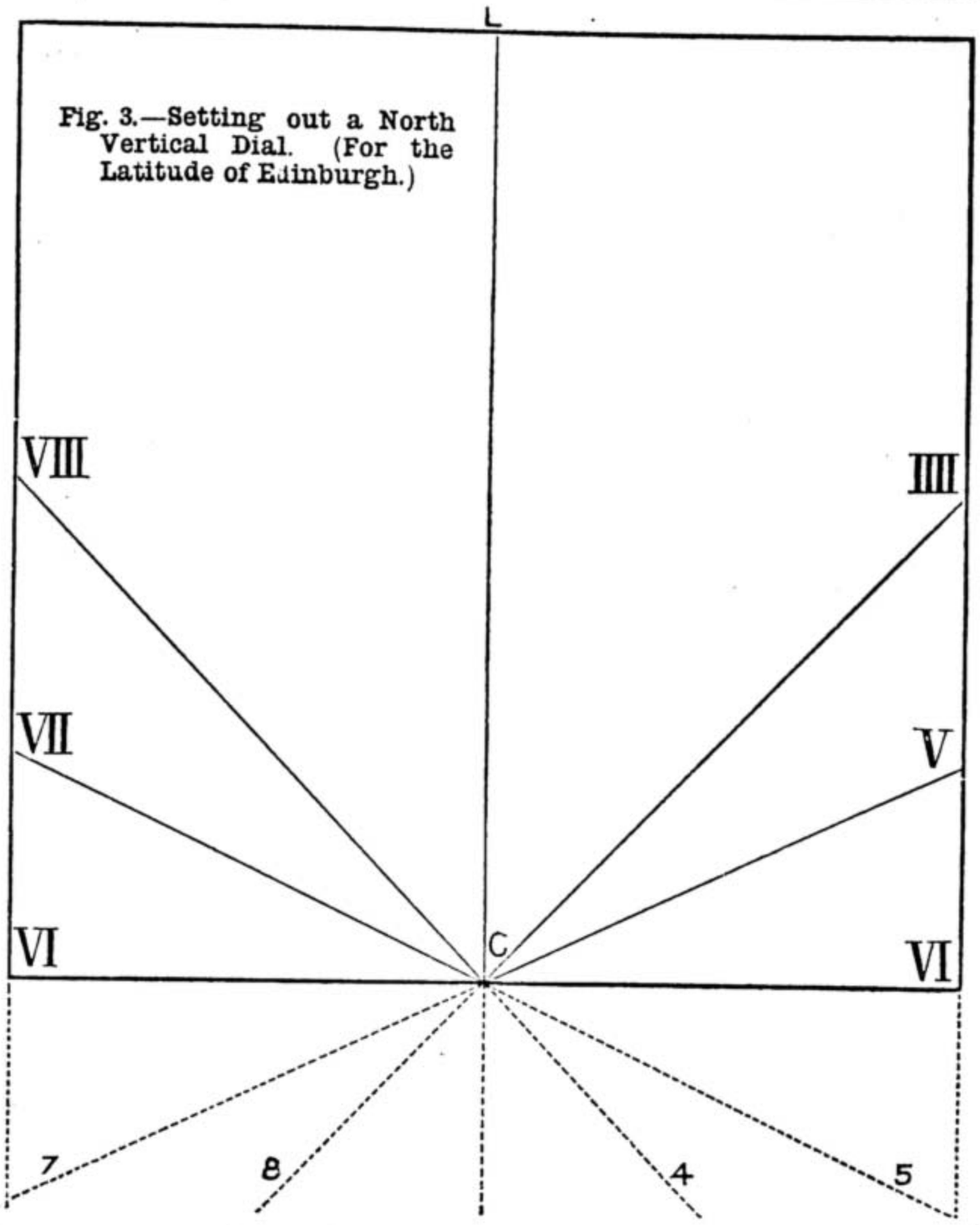

Fig. 3.—Setting out a North Vertical Dial. (For the Latitude of Edinburgh.)

The gnomon for this dial must, of course, have its stile inclining to the dial at the angle of the complement (in the present instance at an angle of 34°). Such an angle is that at *d c e*, and could the triangle, *d c e*, be turned upright on its edge, so that c *d* should form the substile and c *e* the stile, we should (in theory) have the gnomon we require. In practice, however, this gnomon would be too short to throw its shadow to the numerals which mark the hours. In this and in all cases, as was insisted in my former article, due space must be allowed for the thickness of the gnomon in transferring the plan to the actual dial.

In setting out a *vertical north dial*, the most easy method is first to plan a vertical south dial as above directed, then to take the paper on which the plan of the north dial is to be drawn, and so fix it that its bottom edge may exactly coincide with the 6 o'clock line on that plan. This procedure is illustrated in Fig. 3; VI. c VI. is the 6 o'clock line in Fig. 2, and the dotted lines below it represent the lines in the upper portions of Fig. 2. All that then remains to be done is first to produce the meridian, as at L; next to produce the lines 7, 8, 4, 5 through C to the edge of the paper, and these will give respectively the morning hour lines, V. and IIII., and the evening hour lines, VII. and VIII.; we have the VI. line already, and for the remainder of the day a north dial is useless.

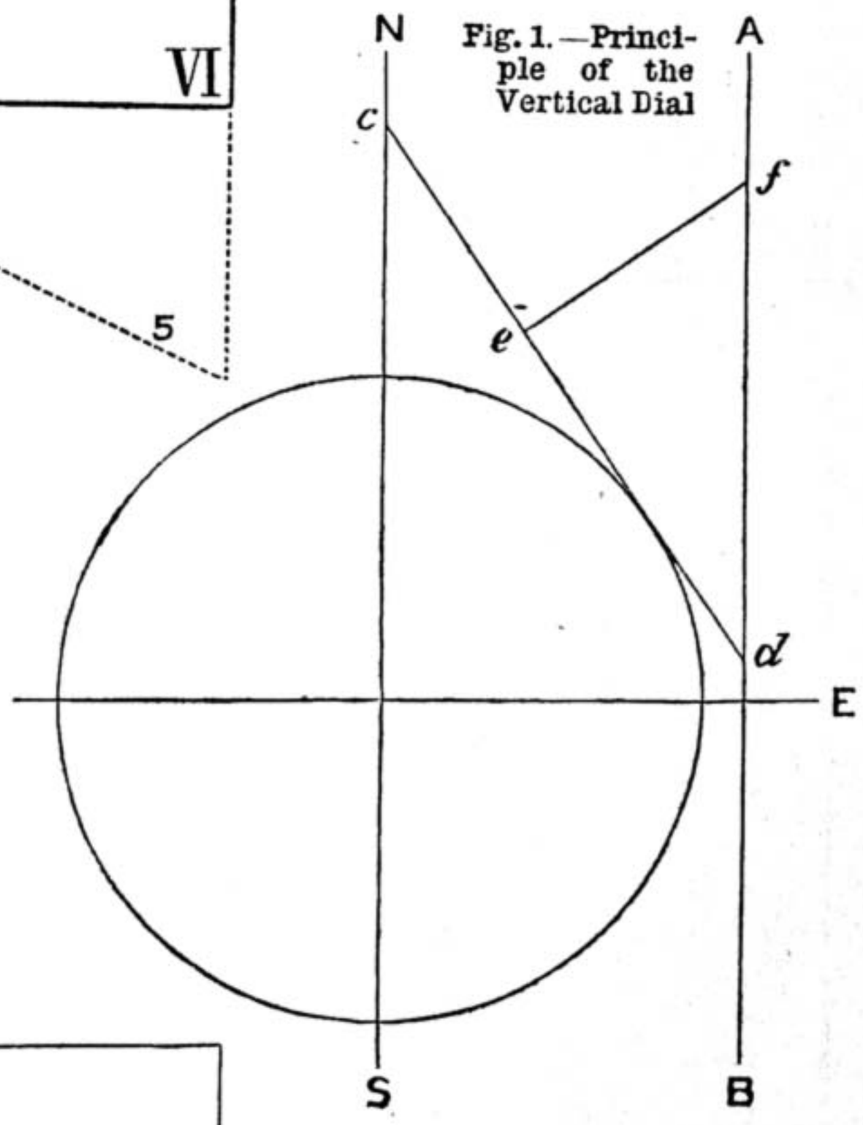

Fig. 1.—Principle of the Vertical Dial

The gnomon is precisely the same as that of the south dial, but *placed bottom upwards*, the angle equal to the complement resting on C, and the substile falling along the meridian in the direction of L.

In a third and concluding paper I shall show the reader how east and west vertical dials are constructed, and thus bring my remarks on this interesting subject to a close.

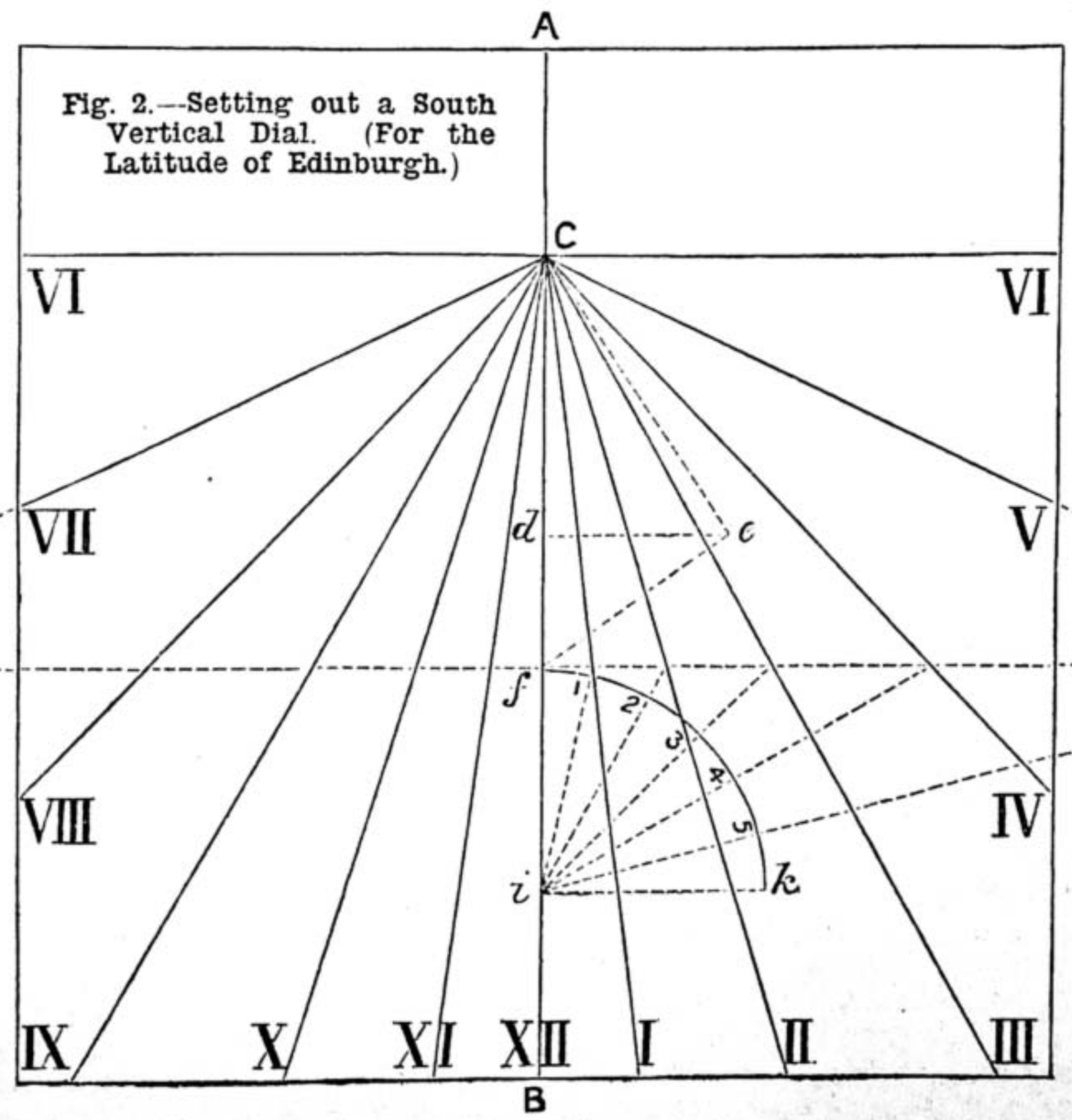

Fig. 2.—Setting out a South Vertical Dial. (For the Latitude of Edinburgh.)

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MEANS, MODES, AND METHODS.

A New Method of Enlarging Drawings, Diagrams, etc.

Of enlarging methods, first comes the simple one mentioned by O. B. in Vol. I., p. 210, and myself in Vol. I., p. 552, of squaring, which method is also available for the reduction of drawings, etc. Then there is the

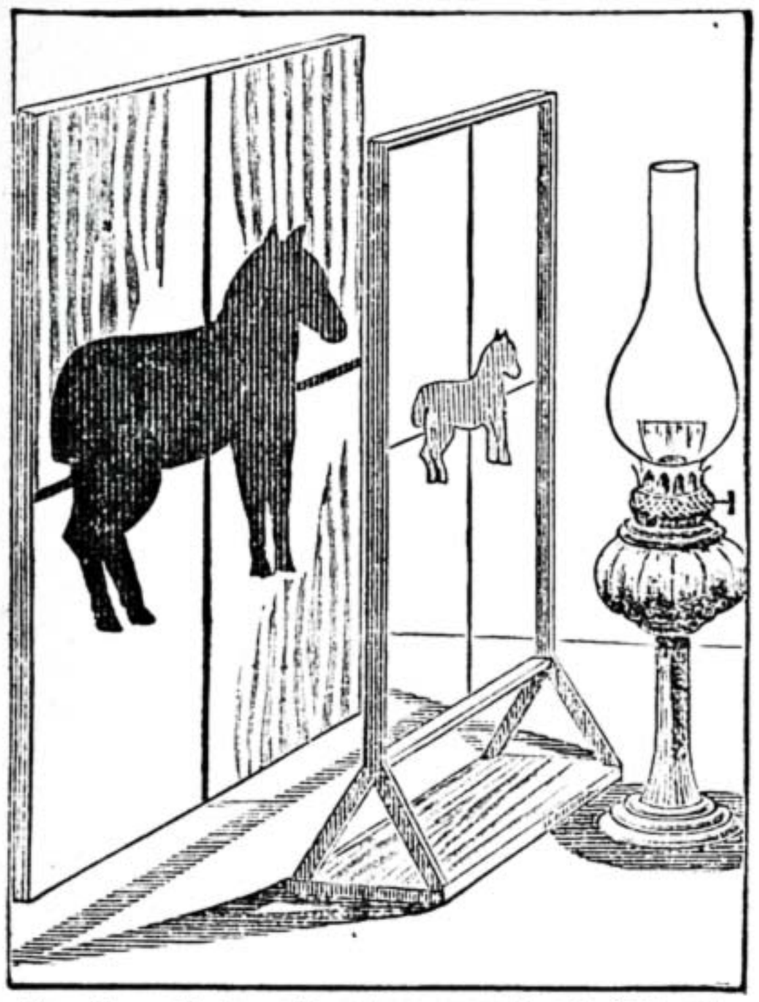

Fig. 1.—Mode of enlargement of Cut-out Diagrams.

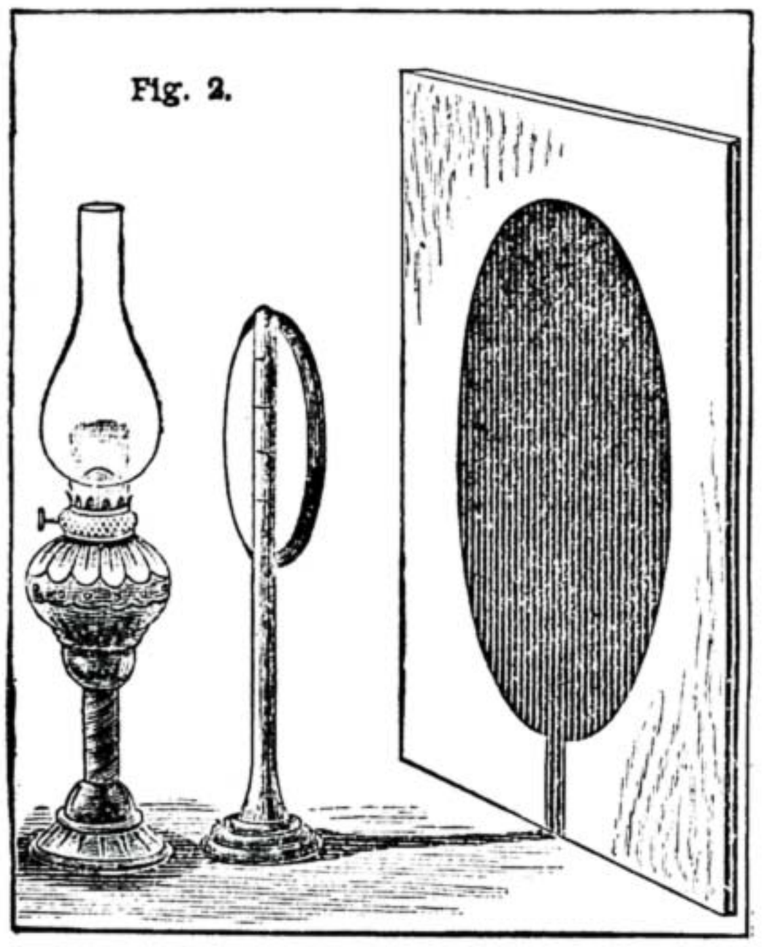

Fig. 3.

Fig. 4.

Fig. 2.—Mode of obtaining Oval with Circular Board. Figs. 3, 4.—Extremes of Ovals thus obtained.

pantograph, Vol. I., p. 669; and now comes a method which I have never before heard of, and yet it is very simple. The artist of the Waterloo panorama has stated that he has a secret process of enlarging drawings and pictures, and that the present stupendous paintings were reproduced from a roll of drawings *ten times* smaller in size. Whether the method I mention is adopted by him, of course I cannot say; but it is capable of being so used if the paintings are done on *very* transparent paper, which process, however, would be nothing more nor less than that of the magic-lantern idea. I have never heard, however, of the *shadow* process being used, and so I give it, knowing that it is open widely for improvement.

Every one knows that when an object is placed between a light and something solid a shadow of the object is thrown upon the latter; and that, according to the distance the object is from the light, so is the size of the shadow regulated. Supposing it is required to enlarge a drawing (of course this plan only gives outlines, unless, indeed, the trouble is gone to of cutting with a sharp knife along the internal lines of the drawing, when the light shining through the lines would be a guide), for example, say, take the half foot in Vol. I., p. 553, and paste the sheet on to a piece of thick card; then cut it out nicely. Another similar half, shaped, and pasted to it in the reverse direction, will give the complete foot. A strong powerful light is needed, and it should be level with the centre of the object, the latter being held quite perpendicular. The board to be cut should be placed at a short distance from the light, and the object to be reproduced must be fixed by some means when its position is decided upon, as in Fig. 1. A sharp outline to the shadow can be obtained by properly regulating the distances of the object and board from the light. The advantage of this method is that, as the reader may choose upon another size for an intended article than that given by any particular writer, he can thus easily reproduce it *any* size.—J. S.

An Easy Method of Obtaining Ovals of any Size.

In reference to my shadow-enlarging process, I have found a most simple way of obtaining an oval upon a board, the exact size of which it may be difficult to decide upon. Get a *circular* board, say about 1 ft. in diameter, and mount it so that it will revolve upon a stand, similar to that shown in Fig. 2. Place the board to be cut at a distance from the light. A circle, or *any* proportioned oval, from the elongated one shown in Fig. 3 to the true one shown in Fig. 4, can be obtained by revolving the circular board; and *any sized* oval can be obtained by regulating the distance of the circular board from the light. The edge of the circular board must be bevelled.—J. S.

HOW TO FIX LOCKS.

BY B. A. BAXTER.

The great and perpetual annoyance caused by ill-fitted and badly-fixed locks is the only, but perhaps sufficient, excuse for this paper, and the hope that the writer may assist some few young workmen is his encouragement to explain what he can of the matter.

In the first place there are a great variety of locks, of which some are easily fitted, and some with much greater difficulty. Rim locks, for instance, are the ordinary door locks fixed on bedroom doors in the cheaper sort of houses. (Please to understand, not low-rented houses, but houses built at a low price.) These locks are about the simplest to fix of any, and they shall, therefore, be the first to be explained.

In fixing a rim lock, then, first fit the flange—which, by the way, does not now always exist, but used to do. Having applied the lock to the door, and marked round the flange with a knife or a pointed awl, cut the recess for its reception with a sharp chisel. A second application of the lock ought to prove that the flange exactly fills the recess. The holes for the spindle and the key can then be marked with a sharp-pointed awl. Bore the holes as nearly the size as the bits can be obtained, and, if possible, have a Jennings bit. There are no better, and every tool maker supplies them. Be very careful not to force the bit to cut faster than it will. A $\frac{3}{8}$ in. bit is about the size required for an average key, but as these bits are made to every sixteenth from $\frac{1}{4}$ in. to $\frac{3}{4}$ in., and every eighth beyond, and they are so useful for many other purposes, they may be bought freely, and the purchaser will not regret the outlay.

On the key will be found a shoulder or stop, which, abutting against the plate of the lock, keeps it in its right position to enter and turn. This shoulder will give the size of the bit required, for the hole must be large enough to give freedom, but small enough to give guidance, so as to make it easy to go right, but difficult to go wrong.

It is essential to the proper entrance of the key that this hole be square to the surface of the door, both when a square is applied with the stock horizontally and vertically. This reminds me of an ingenious, though simple, appliance sent out with a lock which I saw recently in a West-end mansion in course of repair. It was a cast iron guide, having a plate similar to the edge flange of a mortise lock, which was to be fixed temporarily on the door, the holes (which were bored for the purpose) being in the correct position for the lock itself when it came to be fixed. The hole, cylindrical, 1 in. in diameter, having been turned out, was truly at right angles to the flange, and the workman could, therefore, bore a 1 in. hole quite truly with ease and certainty for the reception of (in this case) the cylindrical lock. I ought to say that the appliance was to be returned to the lock maker, as, of course, it would be of greater value than the profit of one or two locks would cover.

However, any one could take a hint and bore a hole through a piece of wood from end to end—say, 6 in. long—get it turned, and a disc shouldered on, and also turned on a mandrel, having the hole, therefore, truly centred.

But though useful as a guide, this refinement of accuracy is not needed for our rim lock. It will be true enough if we take precaution that the head of the stock is held the same height as the point of the bit and in the other direction as square as the workman can judge. Do not, when the bit ceases to progress, force it, but rather remove the chips if they should be filling the grooves of the bit, and examine the other side of the door to see if the point has made its appearance. If so, the hole may be completed from that side. Another hole should be made for the bit of the key with a boring bit of a suitable size, with the same attention as to squareness, and the two holes cut into one by a key-hole saw. Take care not to cut away too much, which a crooked saw will almost be sure to do; but if in danger of so doing, only cut once in the centre of the hole required from one to the other, and complete with a thin chisel.

The hole for the spindle can be bored with a $\frac{1}{2}$ in. bit, and if each has been carefully done, nothing remains but to screw the lock on and fix the box or staple, cutting in the edge if needful; or in the unusual case of a too shallow box or staple,

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mount it on a piece of wood. In either case, see that the bolt and latch of the lock have just enough freedom when the door is locked—say, about the thickness of a veneer or stout card.

A till or drawer lock presents some difficulty to young workmen, but by taking each detail singly, and being careful to do each correctly, a neat job can be done by the young cabinet-maker.

First ascertain the centre of the drawer front and mark it *lightly* with a pencil. Mark the exact distance from the top edge of lock to the centre of the key-pin on the front of the drawer. Bore for the key on the intersection of the two lines above mentioned. Cut down for the bit of the key from the front with a pad-saw or a thin chisel. Carefully set out the position of the plate on the inside of the drawer. This can easily be done by measuring right and left from centre of key-pin. Let in for the body of lock and the top flange before venturing on cutting in for the back, trying the key to make sure that the position is correct before using the chisel too freely.

When screwed on, the bolt can be cut into the frame of the drawer by touching the bolt with oil soiled from the oilstone, then causing the bolt to touch with the key; the oiled bolt will then print its impression on the frame. A mortise must be cut with a small chisel for the reception of the bolt. If a thread escutcheon is to be used, the keyhole may as well be cut to fit the escutcheon at first as enlarged afterwards.

Thread escutcheons may be marked on the work by pressure or a slight tap with a hammer, which will imprint the outline of the escutcheon.

Cut cupboard locks are put on in a similar way, except that the hole for the key *can* be bored from the inside, which it would be difficult or impossible to do in a drawer.

Flat cupboard locks need no cutting in, but are unsightly. They have the advantage, however, of being equally available for right or left, which a cut-cupboard lock is not.

Chest and workbox locks are similar to drawer locks, and can be put on in the same manner. The link-plate, however, introduces a difficulty which does not exist in till locks.

It is best to let the link-plate remain in the lock while it is cut in, or it may be found that, though space sufficient for the lock has been made, yet room has not been obtained for the links. The key must be tried before fixing the lock, in order to ensure room for the movement of the bolt. In each of these locks the smallest key-hole that will allow the key to pass is the best, and the hole should be so bored that, when the lock is applied, the key-pin is in the centre of the hole. This, however, might be said of every key-hole, and of the fixing of every lock, were it not for the repetition which would occupy space and weary the intelligent reader. We may decide, however, that it is a less evil to *slightly* shift the lock to suit a key-hole cut somewhat in error than to destroy the shape and enlarge the key-hole in the attempt to rectify the error, or leave the key-hole so that the key binds in it.

There are, however, other locks which need a mortise for their reception. Camp-desk locks, pianoforte locks, and mortise locks for doors, all need mortising. Let us look first at door locks fixed in a mortise. It is obvious that, if the work is finished, as it frequently is, before the locks are fixed, we must not set out with pencils or gauges. We will apply the lock to the door first one side and then the other, similar to the method described for rim lock, but taking care that the flange is flush to the edge of the door. We can then mark the position of the key and spindle-holes with a pointer, as we did for rim locks. There is one caution needed—that is, to see that the edge of the door is square; if not, the marking out, as described, will not agree, but will differ by the amount of variation from the square edge. As is usually the case, truth lies between the extremes, and generally a compromise must be made, the amount of which must be left to the workman to decide. By all means cut the key-hole and bore for the spindle first, then proceed to mortise for the lock. In this case bore as much of the wood away as possible, and be sure not to make too tight a fit. If you do, in trying the lock and removing it you will disfigure the door and add materially to your labour, without any compensating advantage.

Having bored all you can (more than I have bored you), clear out with chisels. A curved mortise lock chisel is very useful to finish with. When enough has been cut away to let the lock in, the flange may be let in and the lock fixed.

Then comes the striking plate. We cannot do better than adopt the printing plan, as we did for till locks, and mortise for the latch and lock bolts; then when the brass plate is applied at the right height, and just showing the mortise edges coincident with the edges of brass striking plate, it can then be marked round, cut in, and fixed.

The patent mortise furniture now so much used in preference to the old set-screw fixed knobs gives some trouble, because the screws that fix the rose—in this case not merely an ornament, but a flange, on which the knob can turn, but yet is fixed—are so close to the knob that no tool can bore the holes as squarely to the face of the door as is desirable, and if the knob is not fixed correctly, it will have to be altered. The best way, probably, is to mark the position of the holes when the knob *is* in its right place, which can only be ascertained by trial with the square spindle in its place through lock and into knob. Then removing the knob, but noticing the position of flange, in order to keep the same holes to each other that have been marked, bore the holes, replace the knob, and fix. The reason why we must keep the flange as we have marked it is because the screw-holes bored in flange—generally four in number—are not always equally distant from the centre or from their next neighbour.

A remedy for this difficulty might be found in enlarging the rose and putting the screws nearer the outer edge, but we shall have to wait for this until lock-furniture makers fix a few sets of their own furniture.

Improvements are always to be looked for in those whose vision is enlarged by a little work in other than their own particular branch of trade. It must have impressed a lock-maker if he tried to turn the key in some of the old locks that its close proximity to the knob was a disadvantage, and that the knob would be better at a greater distance from the edge.

The writer of this must confess that had he not once caught his knuckles between the edge of a door frame and the handle of a Norfolk latch, fixed by some careless workman too close to the edge of door, he would have been less careful over every latch he has fixed, and hopes this hint is enough to prevent some other hands from harm. *Verb. sap.*

Camp-desk locks and pianoforte locks are also fixed in a mortise. In the first, be sure to see that the edge is bevelled to the right angle. In the second, the workman must see that the mortise is made at the correct angle, for the flange is not generally square to the body of the lock, and pianoforte locks are superior to the desk locks, inasmuch as, when unlocked, the bolts are flush with the surface, and therefore are not in the way. Desk locks are just the reverse of workbox locks, the hooked bolts taking the place of the link-plate.

Night latches for street doors are locks which require careful fixing. Measure accurately the distance from edge of lock to centre of key-pin, mark the same on inside of door, and bore for key-hole, cutting for bit of key with a small mortise chisel as neatly as possible. The latch can then be applied, and the flange cut, trying the key before fixing the lock. If the pin on which the key turns projects from the lock (which it does, generally), the workman can cut in the flange first to the correct size, and then applying the lock, taking care that it is held parallel to the door, though it cannot yet be held close to its surface, press enough to imprint the position of key-pin upon the door. This will at once, if the lock has been carefully adjusted to the position, give the centre of hole for key. This method is the better plan if key-pin is projecting enough, and particularly if it is pointed.

And now for a few words on ordering locks.

Always tell the ironmonger the thickness of the door, and see that the key is long enough, especially in rim locks or night latches; if not, either a return of the lock, an unnecessary cutting in, or an alteration of the key, is required. For a very thick outer door, I advise the use of mortise locks whenever the expenditure of a few pence is no object of consideration; and if you fix locks for a customer, provide the best you are allowed to supply. If you are required to fix common locks, be candid enough to say so, whether provided by you or by the householder.

Be always ready to say which side you want the locks, right or left—that is, looking at the door from the outside, the right-hand lock turns the bolt to the right, the left-hand turns the bolt to the left. In this the lock is supposed to be on the inside. In mortise locks of a modern form there is now no difficulty, as the latch-bolt is, in most instances, reversible, and the striking-plate finished and lacquered both sides; but as there is often no indication on the outside that the bolt is reversible, inquire if that is so, for the fact will be indicated on the label of the parcel from which the salesman takes the lock.

Although the ironmonger may be expected to know his stock, it is not reasonable to expect him to suggest the proper form of lock, or suitable fittings for any particular purpose. He often can, and does; but let the purchaser be thoroughly aware of his requirements, and able to distinguish between those that are obligatory and those that are less important. A rough sketch, no matter how rough, is a great help in obtaining suitable locks; and indeed any ironmongery, each article having its name, and these are so numerous that some time must elapse before a workman can know them all, hence the peculiar value of a sketch. The ironmonger knows at once what is required, and if, in the case of locks, the sketch takes the form of a plan of the door, having the hinges marked, the place of the lock (inside or outside), the thickness of the door,

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width of stiles, and position of the door-stops, a mistake is rendered very unlikely, and waste of time and temper avoided.

Readers will recognise that there are many other locks in use than those treated upon here, but some are so easily fixed as to need no description, and others are so like those treated as to be easily fixed from these instructions.

A SERIES OF CIRCULAR PANELS IN FRETWORK.

WITH HINTS FOR THEIR SETTING.

BY J. W. GLEESON WHITE.

A good many people loftily disdain using published fretwork designs. When one has asked, in all humble modesty, "From whence came your design?" they announce, with self-conscious dignity, that they evoke—or, as they say, "invent" their own. There is a story that—although to some it verges dangerously near the profane—is so apt, that I may be absolved for quoting it. It tells how a self-made man having made his fellow-travellers mad by his egotistic boasting wound up the peroration of his eloquence by exclaiming, "I am a self made man." To this a shrewd Yankee replied, "I am glad to hear it, sir. It relieves the Creator of an immense amount of responsibility!" Now, when these self made designers announce the authorship of their patterns, one is tempted to paraphrase the American's witticism. But, alack! their assumption of the so-called parentage of their ideas is in no way warranted, for of many dozens of such, who ever saw one that was more original than any new group of numerals may claim to be? It may be that any one who writes down, say, thirty-two consecutive figures has never seen the

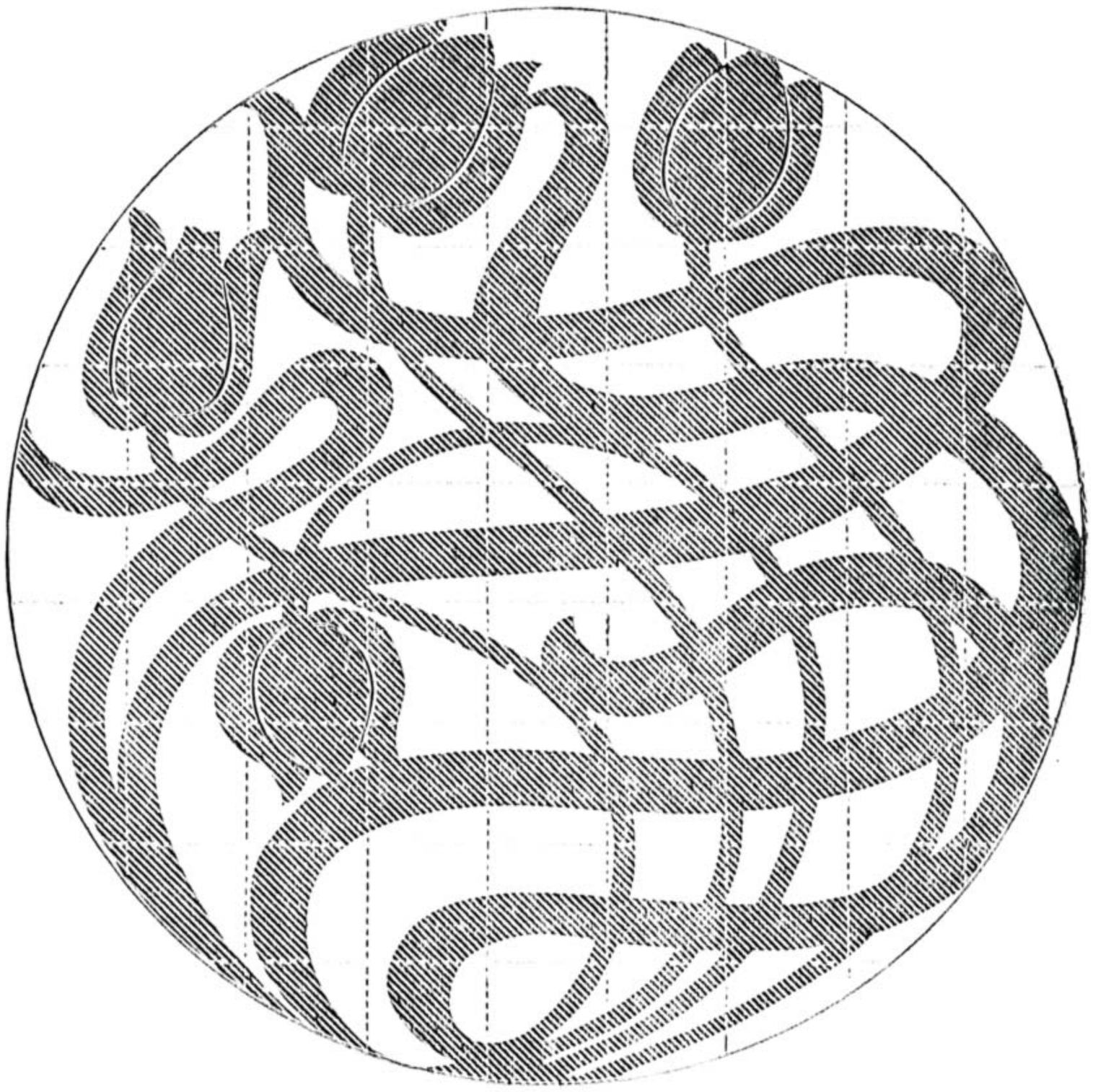

Fig. 1. Circular Panel in Fretwork, No. 1. Half size, divided to facilitate enlargement to full size.

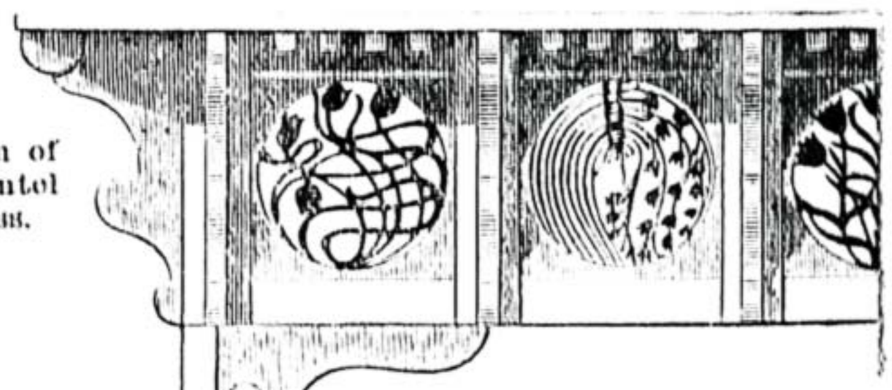

Fig. 3. Application of Panels to Overmantel with Looking-Glass.

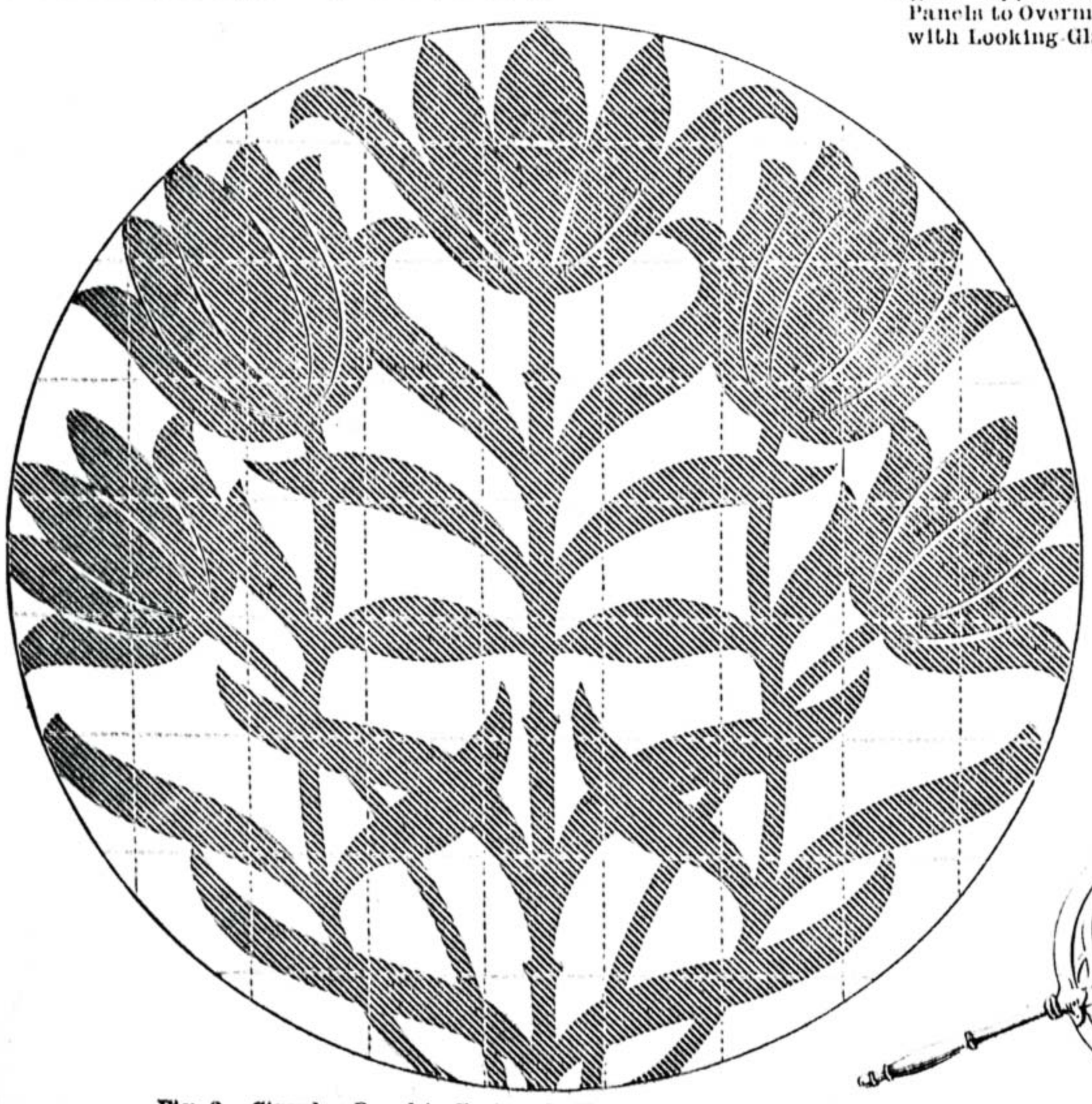

Fig. 2.—Circular Panel in Fretwork, No. 2: half size.

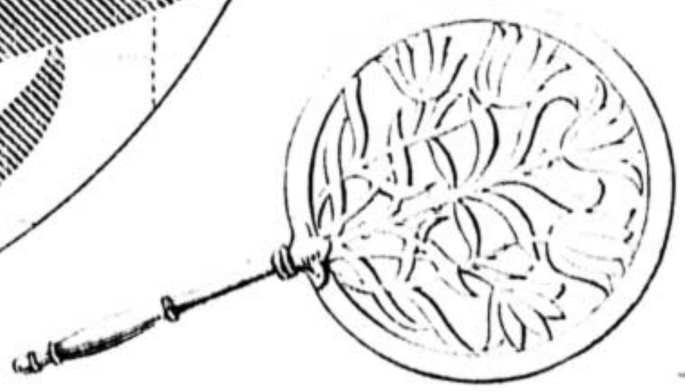

Fig. 4.—Circular Panel as Fan.

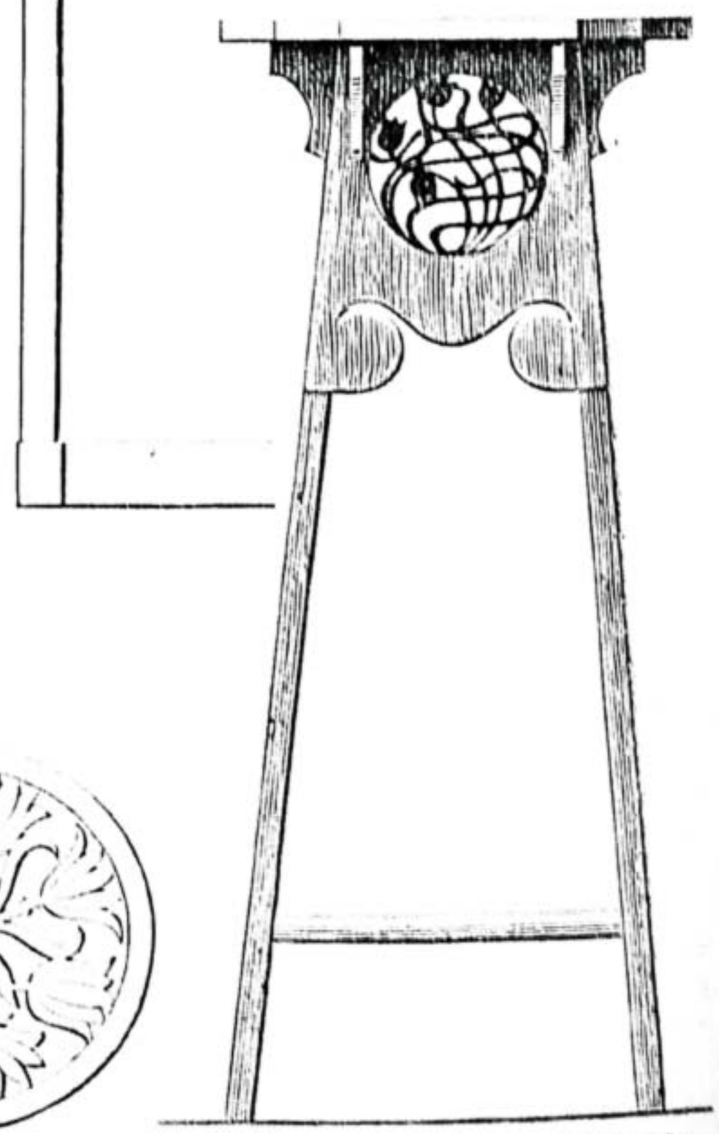

Fig. 5.—Panel in side of Flower-Pot Table.

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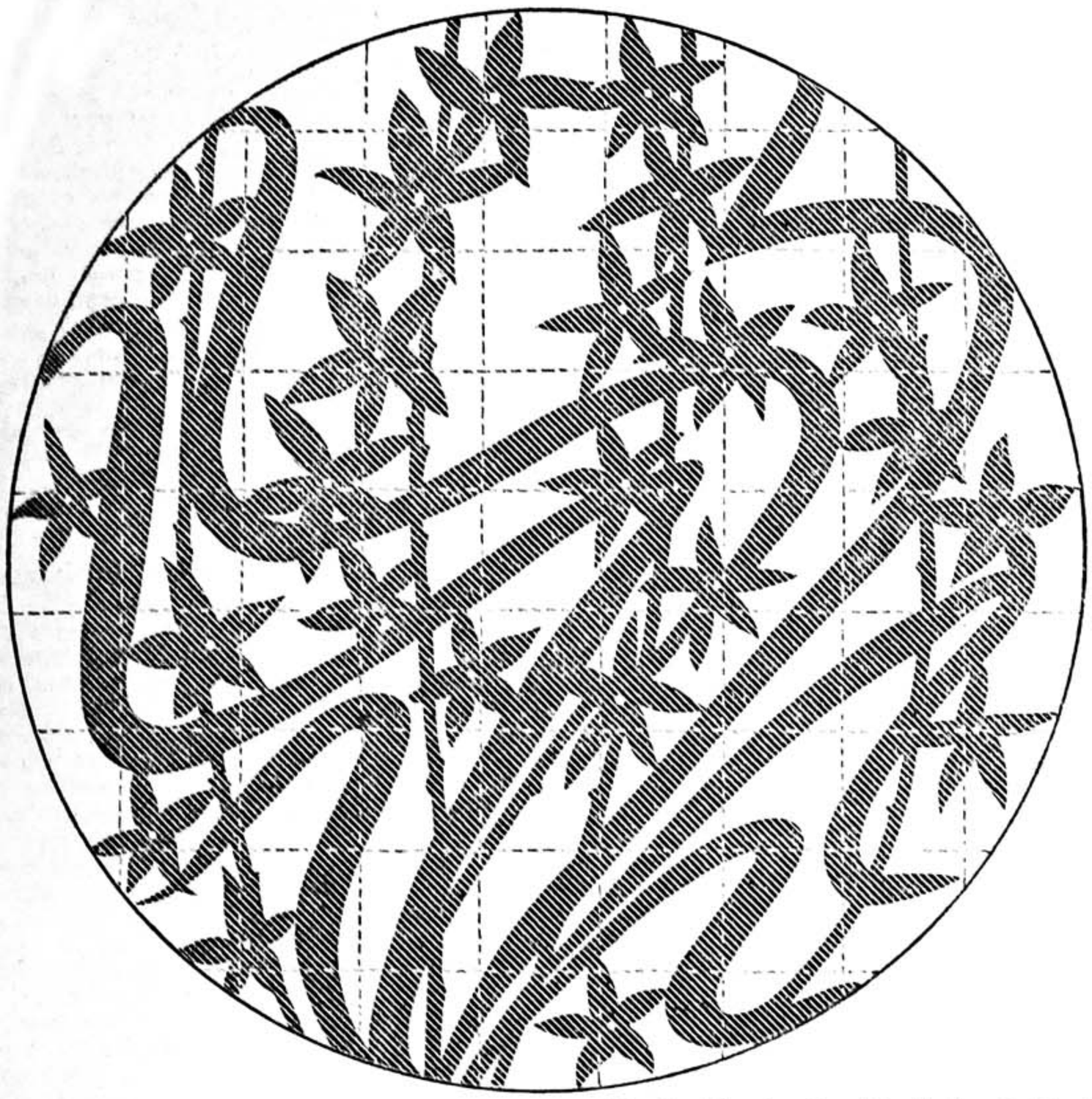


Fig. 6.—Circular Panel in Fretwork, No. 3. Half size, divided to facilitate enlargement to full size.

same array in the same order, but the units that compose the alarming total are as old as the art of reckoning itself—or, at least, as its historical use.

Now, if the aforesaid amateurs would condescend to the truth, as some among them do, they would say, "I picked a bit of this and a bit of that pattern that took my fancy, and fixed them up in a way that just suited my purpose."

By offering motives of fretwork for use according to the taste of the worker, as a compromise between the self-arranged design and the purchased complete pattern, a compromise may be effected that shall please both parties.

These circular panels are intended as details to be worked into any object the operator may wish to decorate. For, be it remembered, a circular ornament has a two-fold value: it tells as a distinct shape of ornament from a distance when all its details are lost; and yet this in no way diminishes the value of the decorative detail it may embody within its arc.

The forms here treated are merely natural flower shapes, suggesting wind-tossed groups of leaves and blossoms, set out in flat, conventional manner, within the true limits of fretwork design. Perhaps it is assuming too much to say imperatively they are so, and it would be more decent to qualify such assertion by saying they are attempts to gain that end.

In this way, cut as separate panels, there is no limit to their use. When feasible, they should be, indeed, worked out of the rectangular panel itself that they purpose to adorn. But since this course is often impracticable, they may be sunk within a circular hole of the material with equal effect.

So used, they may be applied to woodwork intended to be painted, when the

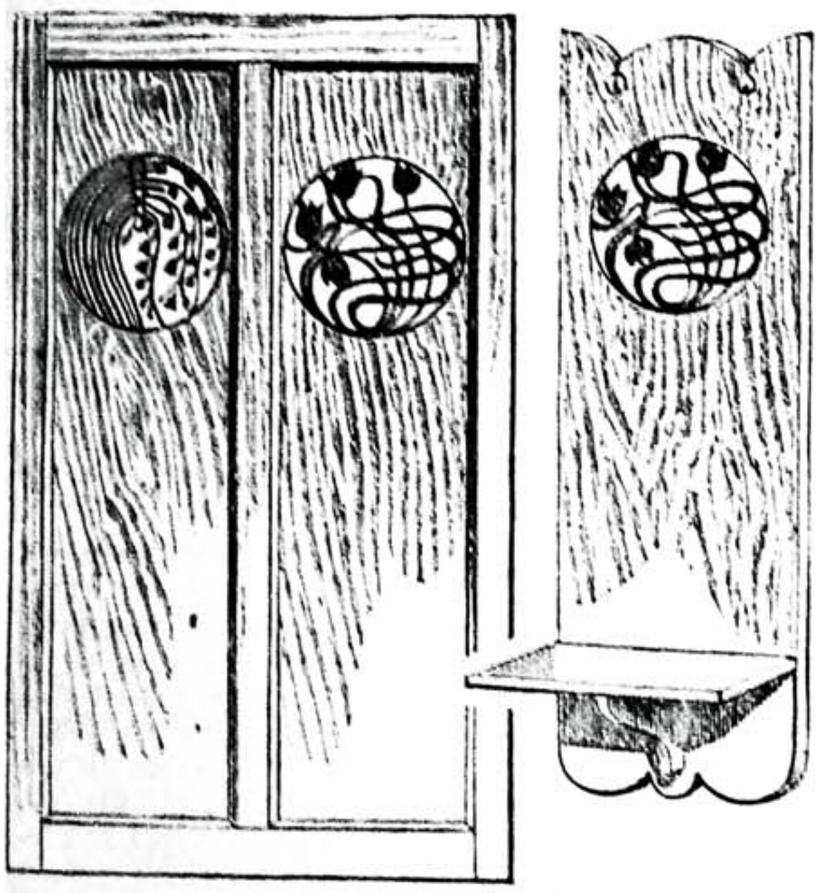


Fig. 8.—Application of Panels to Larger Panels.

Fig. 7.—Application of Panel to Bracket.

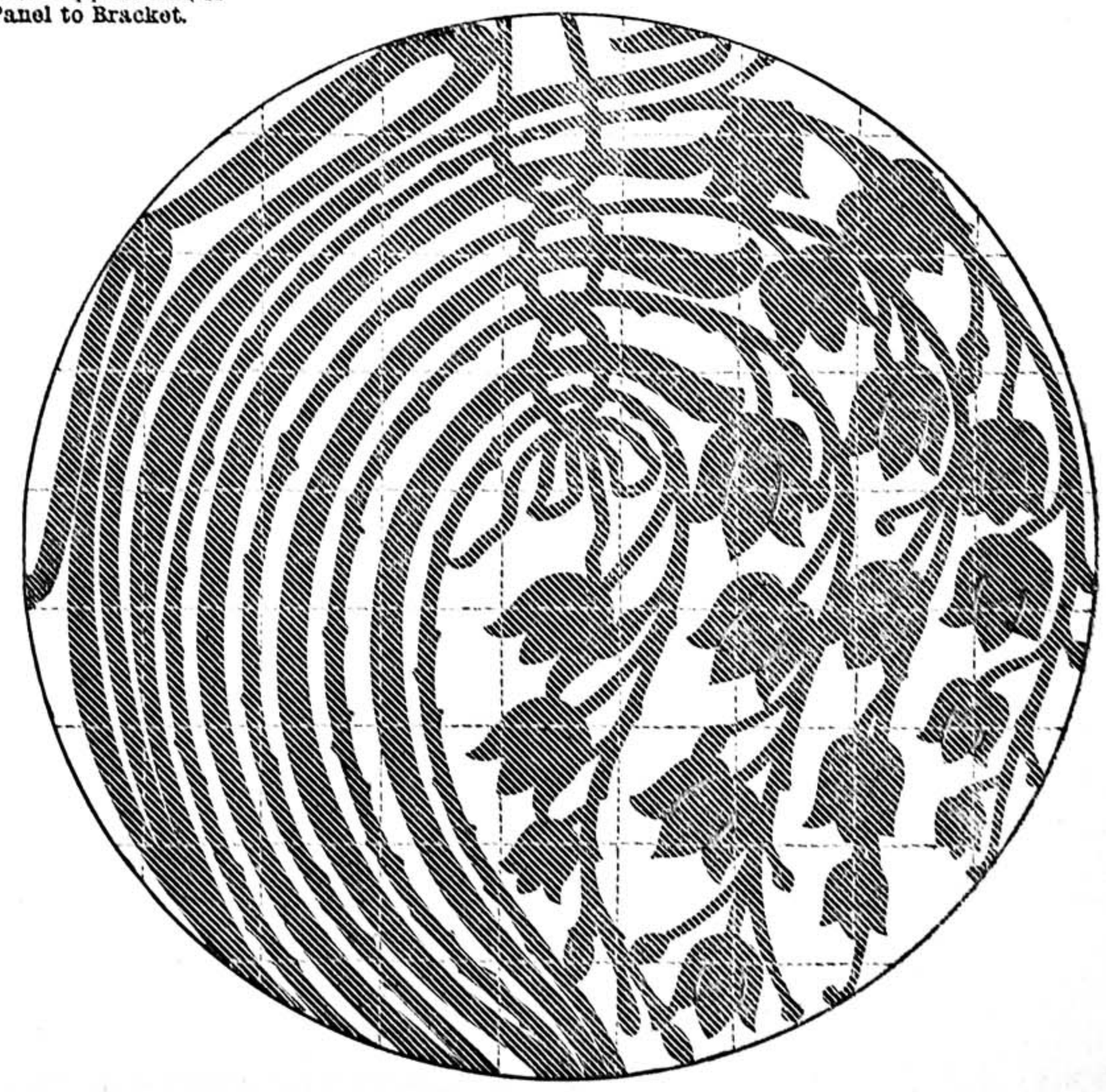


Fig. 9.—Application of Panels to Small Cupboards with Shelves.

Fig. 10.—Circular Panel in Fretwork, No. 4; half size.

slight relief they afford will break the monotony of the even surface of a panel without sacrificing the broad effect of a plain surface.

On no account should I advise them to be "picked out" in colour or gold. If only natural woods, polished or varnished, be employed, then indeed the wood may vary; but if paint, enamel, or ordinary oil colour, are either of them used, let the relief obtained be one of planes only; the shadows cast will sufficiently detach the pattern, with no attempt to exaggerate the ornament by use of divers colours.

The diagrams suggest a few of their possible applications to brackets, medicine cupboards, panels of doors, or sideboards, small tables, over-mantels. A hundred other purposes, to describe which would take needless space, readily suggest themselves.

When two or more of the same design are used, either reverse the pattern in tracing, or fix it at a different angle—that is, let the side that is uppermost in one pattern be the foot of the other. Save in one or two of the panels, this possible use has been provided for in the growth of the ornament.

By using Letts's sectional-scale tracing papers, the designs may be easily enlarged or reduced to new dimensions. They may also be used for stencils or other brush decoration, as well as their original purpose. As carved decoration in low relief, a very little adaptation would fit them for the altered requirements of wood carving. Possibly a future series may attempt similar aims in rectangular and irregularly-shaped panels.

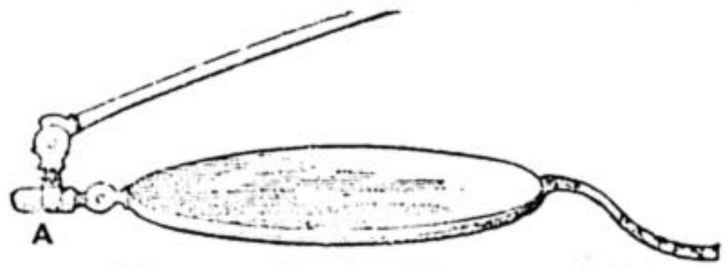


Fig. 1.—Diagram showing Means and Modes of adjusting Spectacles.

Fig. 2.—Spectacles adjusted for Shooting, etc.

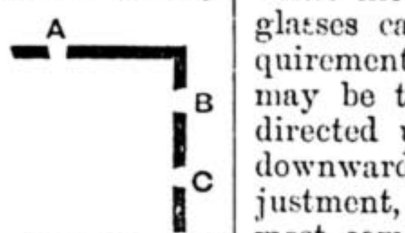
Fig. 3.—Spectacles adjusted for Reading, etc.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

12.—Murray's Metal Frame for Chairs.

I HAVE been asked by Mr. J. Henry Murray, Ashfield, Beau Parc, co. Meath, to make mention of a new mode of making chairs which he has recently invented, and for which I believe he has obtained provisional protection. I cannot illustrate the invention, because to do so would involve a good deal of space, and he, and my readers too, must be contented with the simple description. First of all, there is a metal frame in the ordinary form of a chair seat, having a broad ledge projecting inwards from its upper edge and indentations—or "re-entering angles," as the maker calls them—at each corner, wherein the wooden legs are fitted. Near the inner edge of the ledge are a number of holes, into which hooks are fitted, from and to which cords are laced, which form the bottom of the seat, and give support to the stuffing and upholstery; and utility and importance for this is claimed on the plea that it can be quickly unlaced when it is required to renew the stuffing of the chair seat. In the corners of the frame the legs, and at the rear the back, are inserted and bolted to the frame by screws and nuts, the nuts being on the inside so that all may be readily taken to pieces in case of removal. Mr. Murray claims that the formation of the angle metal frame gives great rigidity, combined with lightness and durability, and allows of the above method of fastening the legs. To make this and what is to follow completely clear to the reader, let the annexed diagram represent a section of the chair frame on the right-hand side, the section being so managed as to show the perforations in both members of the frame. Then A will be one of the holes in which S hooks are inserted to carry the lacing that forms the seat of the chair. The perforations, of which B is one, in line in the upper part of the lower member of the frame, enable the covering, or trimming, to be laced or stitched on, thereby avoiding the use of tacks. The moulding can be screwed on from the inside—that is to say, by screws passed into the moulding through the holes indicated by C. If preferred, the trimming and moulding can be finished in lengths, and screwed on afterwards by means of a thin slip of wood, to which the moulding is fastened by glue or otherwise. I have now given as fully as I can the principle of Mr. Murray's invention, and I wish him every success in disposing of it, I am bound, however, to say that, to my mind, the plan of bolting the legs, as separate parts, to the metal frame is structurally weak; and as chairs, especially heavy chairs, are not always lifted from spot to spot, those that are made in the manner described will soon get somewhat rickety. And no one will desire to be continually tightening up the nuts and laces of the chairs he has to sit on.



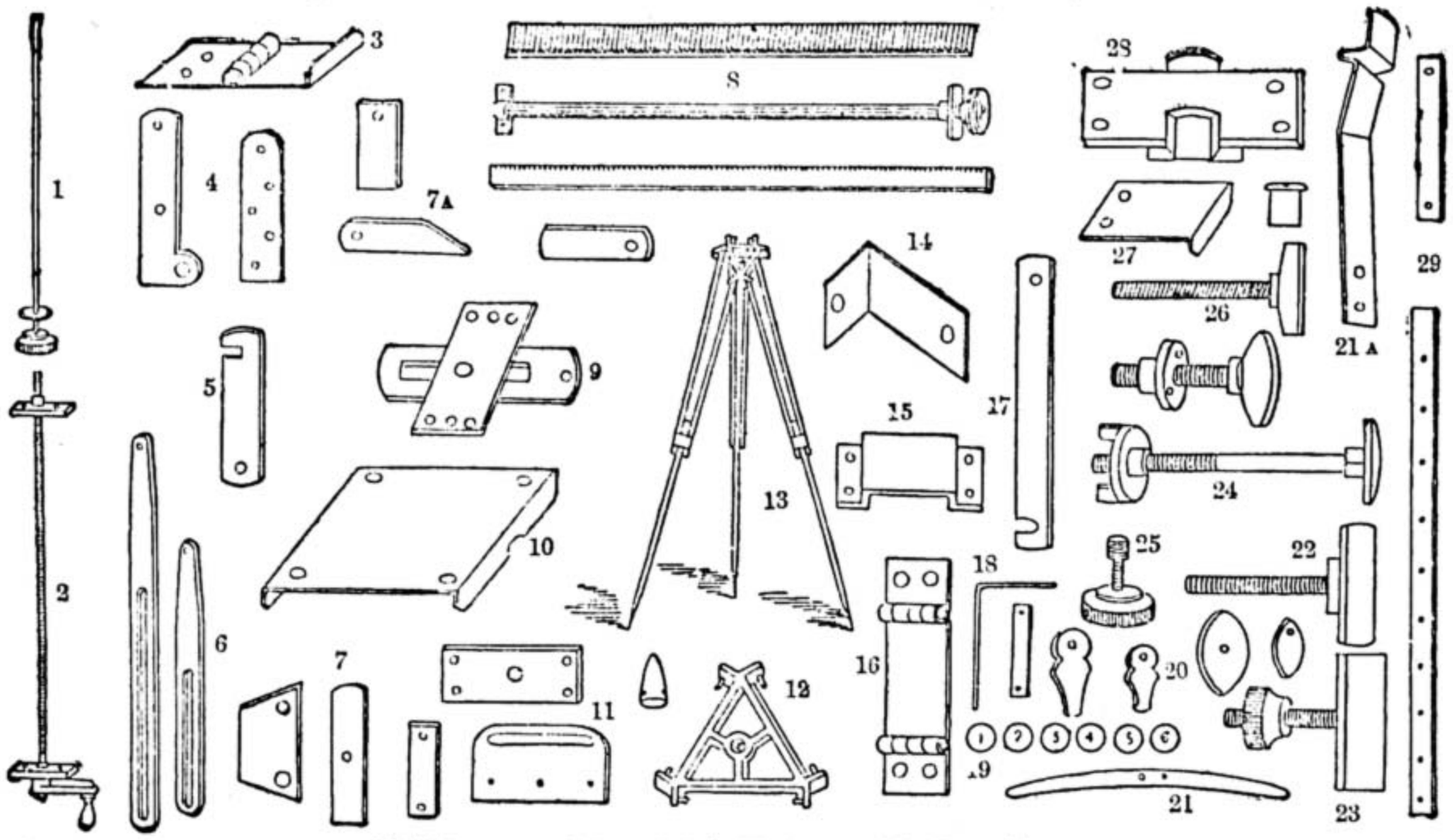
Section of Frame of Chair.

13.—More's New Adjustable Spectacles.

In Figs. 1, 2, and 3 are shown spectacles of a new and improved form, made on More's Patent, and sold by Mr. James White, optician, 209, Sauchiehall Street, Glasgow. The peculiarity of construction exhibited in the frame enables the wearer to adjust the lenses at any moment so as to put them in direct line between the eyes and the object looked at. By this simple contrivance the prismatic and distorted effects frequently resulting from the use of ordinary spectacles are completely obviated. The means adopted can be gathered from Fig. 1, which shows one only of the two glasses. The wires on each side turn by means of the loop, A, on the axis, so to speak, or the ends of the axis of the spectacles, and hence, when the spectacles are placed in position, the glasses can be easily adjusted to suit the requirements of the wearer—that is to say, they may be turned to accommodate the eye when directed upward (as in Fig. 2) for shooting, or downwards (as in Fig. 3) for reading. The adjustment, indeed, by the wearer to the best and most comfortable position for any kind of occupation or pursuit can be obtained at once, which is also very desirable for peculiar lenses ordered by oculists, as the frames, as already pointed out, can be adjusted to a nicety. The specimen glasses sent by Mr. White are well made, and comfortable to wear.

14.—Watkinson and Lonsdale's Photographic Brasswork.

I have received from Messrs. Watkinson and Lonsdale, manufacturers of photographic, scientific, and laboratory apparatus, photographic rack and pinion, milled screws, and camera fittings of every description, New Briggate, Leeds, a parcel of their photographic brasswork and fittings, finished and unfinished, which appear to me to be well made, and thoroughly well fitted for the purposes for which they are intended. Price lists, I may say, are sent free to all who may apply for them, and Messrs. Watkinson and Lonsdale will make any special fitting that may be required to order and drawing. I give herewith engravings in miniature of many of the fittings for cameras, etc., supplied by the courtesy of the manufacturers. These comprise (1) extension rod for reversible



Watkinson and Lonsdale's Photographic Furniture.

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back, (2) focussing screws, (3) clip hinge, (4) side hinge plates, in lieu of rule hinges, for short focus cameras, (5) camera catch, (6) side struts (7, 7A) stops and turn buttons, (8) rack and pinion sets, (9) double swing-back fittings, (10) binding plate, (11) slotted plate for rising fronts, (12) triangles for tripods, (13) "Airedale" sliding stand, (14) corner plate, (15) bridge for strap handles for carrying camera, (16) double hinges for cameras, (17) hooked strut, (18) crank turn pin for dark slides, (19) ivory numbers for dark slides, (20) turn buttons, (21, 21A) springs for dark slides, (22, 23) T-bolts with milled nut, (24) tripod bolt, (25) milled head front screw, (26) camera screws for attaching camera to stand, (27) clip, (28) screw bolt for studio cameras, (29) guide strips for cameras. The prices, in all cases, appear to be extremely reasonable. THE EDITOR.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

NOTICE TO CORRESPONDENTS.

*** In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—LETTERS FROM CORRESPONDENTS.

Mitre Cramps.—H. B. (*Chatham*) writes:—"Having seen in WORK several mitre cramps and blocks in recent issues, and not seeing one the same as enclosed sketches, I send them hoping that they may be useful to some of my fellow-readers of your valuable WORK. Fig. 1.—C is a

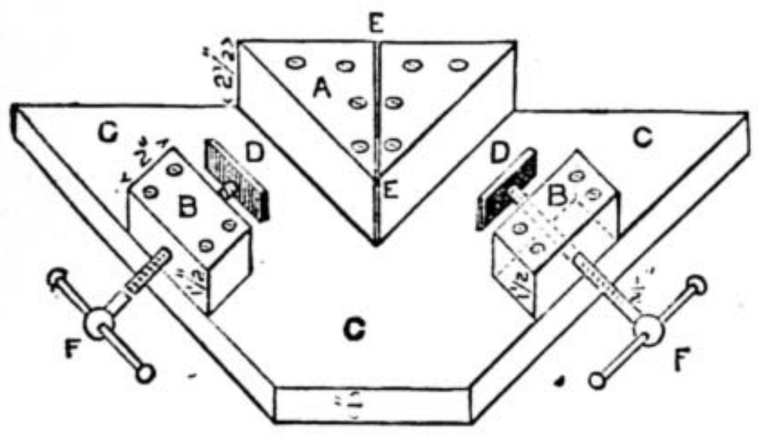


Fig. 1.

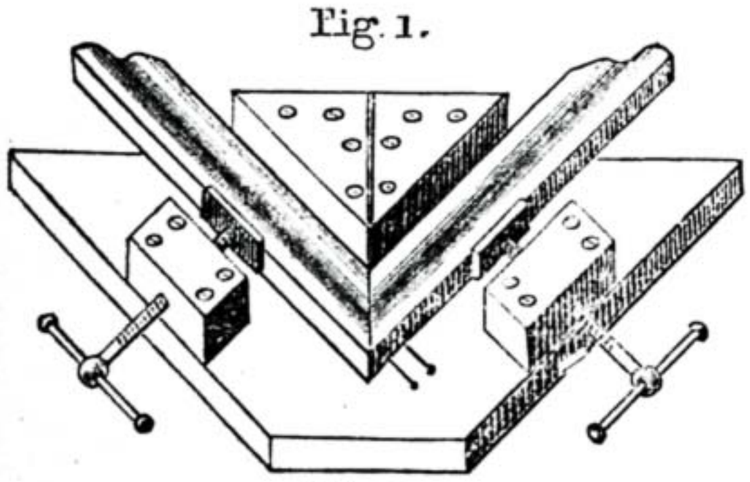


Fig. 2.

Mitre Cramp.

board 1 in. thick; A is a block 2½ in. thickness screwed to C; E is saw cut; B B, two blocks (wood) 2 in. by 1½ in. screwed to board, C; F is bolt with thread, the nut of which is let in the blocks, B; D is thin piece of iron to save the point of bolt damaging moulding. Fig. 2 is the moulding; after being cut it is screwed up ready for nailing."

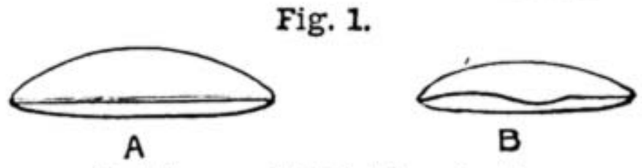
Wheel Cutting.—ALIQUANDO writes:—"Let me remark that Mr. Campin's (Fig. 5, page 792, Vol. I.) wheel-cutting article conveys an erroneous idea. As Mr. Campin says, the centre of thickness of the rotary cutter must be exactly the same height as the line of the lathe centres. Represented as in Fig. 5, the rotary cutter is far above the line of lathe centres, for the top of the top table of the slide-rest is not much below the line of lathe centres (merely enough to take a tool), and to cut wheels in this way the rotary cutter should be represented as close to the top table, and bracket to correspond. Mr. Campin clearly means to convey the utilising for wheel-cutting a lathe's own slide-rest, not the fitting up of a second slide-rest to the lathe for such work."

[ALIQUANDO in his critical remark has answered himself in mentioning that I state the proper position of the cutter. It is nearly twenty-five years since I worked in a shop, but I know that the top slide must be taken away to adapt the cutter slide as I suggest.—F. C.].

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

To Cut and Polish Opals.—E. L. B. (*London, S.E.*).—E. L. B. asks how to cut and polish agates, jasper, and opals. And although I am willing to go into the whole matter as usually carried out, still the lapidary's bench and mills, which work horizontally, are not generally useful tools for an amateur, like an ordinary lathe is. So for a week or two I will postpone that part of the reply, as I rather fancy that some of the tools used by mechanical dentists may be made available for the purpose of polishing stones. The reason of this division is that the stones mentioned are of different hardness, and require different material and appliances for their working. Now, opal is a soft stone, and can be cut into shape with a (medium or fine) corundum file, and water—or even with a fine steel file. Next get them smooth by rubbing them with a piece of rag-stone, or water of Ayr stone, and water; or, better, in a grooved piece of same. Then when the surface has been got quite regular, it has to be polished, which you can do with a leather buff charged with putty powder and water (oxide of tin, I believe, is its other name). However, any jeweller's material shop, such as Gray, Clerkenwell Green, or one of those near Jerusalem Passage, will be able to supply the articles for a few pence. The above is all the actual process, but perhaps it will be as well to give further details. First of all the stone must be held somehow, as it is probably too small to hold in the fingers. So purchase a little lapidary's cement, and put it on a piece of stick, until it is in the form of Fig. 1; it is easily managed by holding it over the flame of a spirit lamp, or of gas. When the cement is in shape on the stick, then you may heat the end again and place your opal on it. Then mould the cement into a nice smooth shape

Fig. 1.



Cutting and Polishing Opals.

with the moistened fingers; and you may make your opal and the top of your cement just warm, but you will get into trouble if you heat this stone too much. When placed thus on the stick you can cut and polish one side and the edge, then by warming it again you can turn it over and do the other side. When you wish to remove the cement which adheres to the stone, just dip it into turpentine or methylated spirit, and it can then be rubbed off. The shape that opals are cut can be seen in any jeweller's window. They are convex everywhere except the edge; they must not be cut with flat surfaces. The edge or girdle itself should be a strong one, and quite straight, like A and not B. A lathe is always used for this work, but, as you state that you have none, I have given a method of cutting and polishing such soft stones without it. These are the materials you will require. (1) Corundum file, medium or smooth; (2) piece of rag-stone, or water of Ayr stone; (3) leather buff; (4) putty powder; (5) lapidary's cement; (6) sticks for same, which you can just as well make for yourself out of a piece of firewood; unless you prefer them turned, then you can buy them at some of the shops at or about Clerkenwell Green, E.C.—H. S. G.

Chair Rivets.—SPATZ (*Bridport*).—For one way of overcoming the difficulty of putting the rivets of the reclining chair in their proper positions see the reply to J. H., who has found the same difficulty as you. The chair, of course, will not fold flat as you seem to expect, but is folding in the sense that its position can be altered and the back raised or lowered as may be desired. The same plan of finding the rivet holes may be applied to No. 1. The position of the rail at B should be between the long stiles of the back and about 1 in. above where the end of the side piece of the seat crosses the lower end of them. This is not shown as clearly as could be wished in the drawing, the fact of its being in perspective being detrimental to the showing clearly of such minute details. For the attaching of the back and front ends of the rope to hang the chair you can either bore a hole in the framing, of the same diameter as the rope you use, and secure it by passing it through and tying a knot on the end, or you can use brass screw eyes, screwing them into the wood at the desired positions. I daresay that you have noticed in these columns a few weeks since a letter stating that chair No. 2 had been patented in this country. I do not know exactly what the pains and penalties attaching to the making of a patented article for your own use may be, but I merely call your attention to the fact, so that you may be aware of it.—G. LE B.

Polishing.—W. H. W. (*Rochdale*).—To polish your pine dressing table use ordinary French polish. Before applying this go over the work with a coat of size. When dry, body in with the polish and finally spirit off in the way which has several times been given in these columns. It is sometimes difficult to get the rubbers into corners so as to finish them off cleanly, and you may have to use a brush, *i.e.*, to put a little varnish in them. The subject of "graph" making will be dealt with on some future occasion in a special article. As has been frequently stated, it is utterly impossible to reply in "next week's issue."—D. A.

Brass, Tin, and Iron Flux.—WOOD-WORKER (*Southsea*).—The flux for brass, tin, and iron is diluted chloride of zinc, that is spirits of salts or hydrochloric acid "killed" by adding zinc cuttings to it till it ceases to work, and then diluting what is left with nearly the same quantity of water. If you are, as you say, a reader of WORK from commencement, you have not been a very careful one, or you would have found this information in my first article on soldering.—R. A.

Enamelling Steel.—AMATEUR (*Glasgow*).—If you have only to enamel a piece of steel 6 in. by 1 in. by ⅛ in., I should advise you to put it in the hands of a respectable ironmonger, who would get it done for you for a trifling sum. It would scarcely be worth while to take up the valuable space in "Shop" to describe the process of enamelling iron or steel, and I expect if it were given you would scarcely deem it worth your while to purchase the expensive plant of muffles, crucibles, chemicals, fluxes, etc. Correspondents can hardly expect that questions involving in their answer a full description of a mechanical trade or process can be dealt with in "Shop," which is more for detail in practice, space for answers being necessarily limited.—R. A.

Bell Telephone.—E. W. (*Hurstpierpoint*).—This querist has set me a task the magnitude of which almost overpowers me. I will, however, do my best to answer as fully as possible with a due regard to the limits of "Shop." I need not tell you that the Bell telephone is patented; you know that, and you know you must not make it for sale, but you want to know if you will be "lible" if you make it for your own use. Now I hardly know what you mean by the above expression, and I have very little experience of the working of the patent laws, but I fancy that if you made and used for business purposes a pair of telephones of the Bell type, you would be guilty of an infringement of Bell's patent rights, and you might be liable to prosecution if the United Telephone Co. thought it worth while to take the trouble. You want to know also if you can make any kind of transmitter with carbon as long as you do not make the one known as the Blake transmitter. Certainly you can, and you can also make the Blake transmitter if you like, but you cannot make and use for business purposes the Blake transmitter, and a great many other carbon transmitters, for the simple reason that they have been patented by their various inventors. All microphone transmitters are not made of carbon, and I do not know how you came by the knowledge that they were all patented. The first one, the one from which all the others have sprung, that of Prof. Hughes, was not patented, but given to the world in the generosity of genius. The microphone transmitter given in page 572, Vol. I., is not patented, for the simple reason that the maker did not apply for a patent for it, and he does not think that it is an infringement on any existing patent. But now comes the part of the task from which I shrink; you want to know what is really patented. I must ask you to try and find this out for yourself. And to guide you a little in your search, I may say that telephone matters began to be talked about seriously in the year 1876, and ever since that time, year after year, even day after day, specifications have continued to flow into the patent offices of this and other countries claiming novelties and modifications in telephone and microphone matters. So if there is a free library in your town, a nice little exercise for you in the evening will be to look up the volumes of specifications from 1876 to 1889, only thirteen years, but then there are about 90 or 100 volumes published every year. It is very interesting, and one gets a world of information from searching through these volumes. I have been there, and I think it would help you very much. The "English Mechanic" receiver is much the same as the one described in No. 28 of WORK. A soft iron rod is used instead of a permanent magnet; the wire on the bobbin is ¼ oz. of No. 30. The iron rod is magnetised by the passage of the battery current through the coil; the diaphragm is made of a piece of jam pot parchment, with a small bit of ribbon, steel, or milk tin stuck in the centre. Two No. 2 Leclanché cells at each end would be sufficient for 100 yards. I could not give instructions to make an automatic switch to work bell, microphone, etc., in this column, for instructions would be useless without detailed drawings, and these would take up too much space in "Shop." I may, however, prepare an article on this part of the subject of telephony, and if the Editor can find room in the body of the paper for it you may get your wish gratified.—W. D.

Pen.—D. B. (*Glasgow*).—I am not certain about it, but from your description I think the pen you want is that known as the audascript. It can be got from any good commercial stationer.—D. A.

Instructions for Cutting and Polishing Stones as Practised by Jewellers.—G. P. (*Camberwell*).—See above reply to E. L. B.

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Microphone Making.—T. D. (*Nottingham*).—You ask for "the best source to obtain practical information on the making of microphone apparatus." Why, man! the best source to obtain information on this or any subject under the sun is WORK. In the number and on the page which you quote, besides the sketch, there is practical information given which will enable any one to make a microphone transmitter. But what is it you want? I can easily give you the name of a handbook on this subject, but you surely do not intend to set to and make all the microphone apparatus described in that book; if you do you will have little spare time this winter at any rate. The books on this subject are "legion," and the various apparatus described in each are "legion," therefore the apparatus may be actually termed legion of legions. As a beginning, you might try Du Moncel's "Telephone, Microphone, and the Phonograph." You might also try "The Age of Electricity, from Amber Soul to Telephone," or "Electricity and its Uses." But if you write to WORK, asking for instructions to enable you to make anything, you will not require to go much further afield.—W. D.

Gilding Moulded Frames.—J. T. L. (*Derby*).—For a short description of the proper method of preparing and gilding compo frames, and which is termed *water gilding*, I must refer you to my answer to B. P., page 603, Vol. I. I am not certain, however, whether you have any notion of this process, or whether your remarks apply to *oil gilding*. I should think the latter method the only one you can wish to take up, unless prepared to spend time and money, besides much patience, in acquiring a mastery of the former. If you have rough plaster or "compo" surfaces, get them clean and smooth with glass-paper and carver's tools; paint with two coats of *enamel paint* thinned with turpentine, and then, after stopping dents, etc., with white lead putty and this hardening, coat twice with enamel only, thus getting a good "face" upon the work before gold-sizing. If the size does not "take" on this nicely, dull it—the frame—down with rag and "turps," or ground pumice, water, and rag. Use *oil gold size*, and buy it ready for use. See several other replies on this subject.—F. P.

Spirit Varnish.—F. R. (*London, E.*).—The ordinary and most simple form of naphtha varnish can be made by dissolving shellac in wood naphtha—a preparation of which, termed "patent knotting," being much used by painters and kindred trades (see article on "Oils and Varnishes"). "Brown hard" would certainly be best for all general purposes, while the "chipping and cracking" qualities would most probably be only with an interior article, or when used under unfair or improper conditions, into which space will not allow me to enter here. Like most inquirers, you don't mention what purpose you thought to put it to. I do not believe in making varnishes generally, unless for one's own professional use, and with experience to guide one—like polishers making their own French polish, etc., and which is a comparatively simple matter. Try Manders' patent knotting before you make any, and see if it answers your purpose before buying the ingredients.—F. P.

Paper-Hanging.—C. B. (*London, S.E.*)—I am unable to give you any information of the books you desire. I do not expect any such have yet been written. Paper-hanging, as a *distinct* trade calling, is but of recent date—say, the last twenty or thirty years. In earlier days it was as often a carpenter's job as a painter's, and it is only in the largest trade centres that we find it followed as a separate branch of work. The wide range in materials and prices of paper-hangings—from the cheapest "pulps" at 2d. a piece to the "Japanese leathers" at 60s., now provided for all classes of houses, and for all conditions of life—make the subject of "properly fixing them" a vast one, and altogether beyond the scope of "Shop." When our Editor is able to find room for a paper bearing on the entire process, you will, doubtless, be well rewarded by a study of it. As your note is but a *general* query, I cannot directly advise you, nor am I able to judge upon what *class* of goods and work you desire help with. We will aid you later on.—F. P.

Washable Distemper.—ONE AT SEA.—In common with yourself, there are many readers of WORK who would like to learn how "to make a washable distemper paint," the writer amongst them. Distemper, or *tempera*, is essentially a water-colour production that is prepared from substances dissolved in water and "bound" together with gum, size, glue, etc., and all of which are equally soluble in water at any time. The two distinctive natures of *oil* (that is, "washable"), paint and distemper (water paint), cannot be *practically* combined for *house painting* by any convenient mixture or process. The ancient *tempera* work of the days of the Pharaohs was, presumably, painted on in water, and afterwards covered with wax. By the addition of hot oil or Russian tallow, and so on, a mixture, with lime or whiting for its body, can be made to stand rain and weather on outsides, but it is not fit for good interior work. J. Orr & Co., of Charlton, Kent, by chemical and mechanical means, make the best I know of—"Duresco" it is called. There are others in the market, but if you *must* have "washable distemper," write the above firm. As a professional worker, I would advise doing without it.—F. P.

Extracting Sugar from Beetroot. — M. H. W. (*Sale*).—The manufacture of sugar requires a considerable amount of capital; but I will shortly sketch the method used in Europe so that you can see if it is practicable to your friend in Manitoba; it may also interest other readers of WORK. The beetroots used are a white variety, not the red used as a vegetable, and contain about ten or twelve per cent. of sugar. They are well washed in water by mechanical agitation, and then torn to threads in a "beetroot rasp." This consists essentially of a hollow drum, A, about 2 ft. in diameter, and 18 in. in the axis, revolving at the rate of 400 to 600 revolutions a minute, and whose periphery is covered with saw-blades rising about ¾ in. from the surface, against which the roots are pushed by means of a wooden block, B, the pulp being collected in a cistern, C, below. Two such cylinders, revolving 400 times per minute, will grind two and

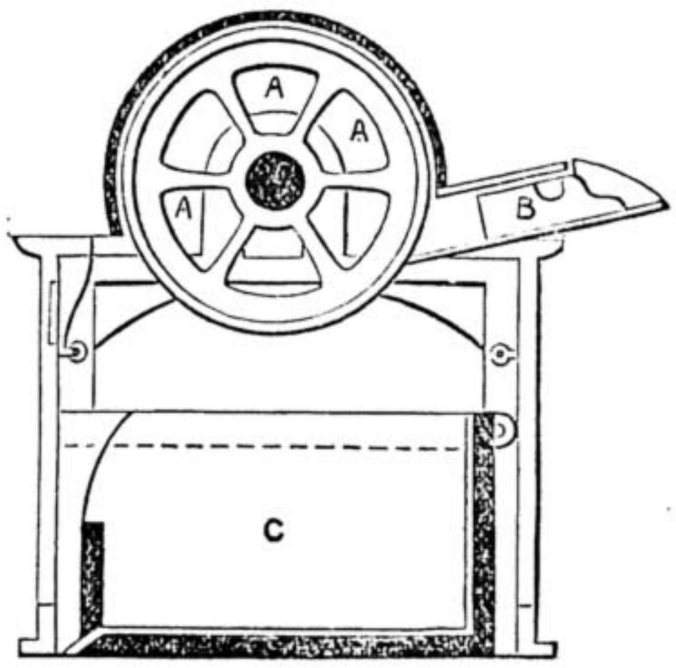


Fig. 1.

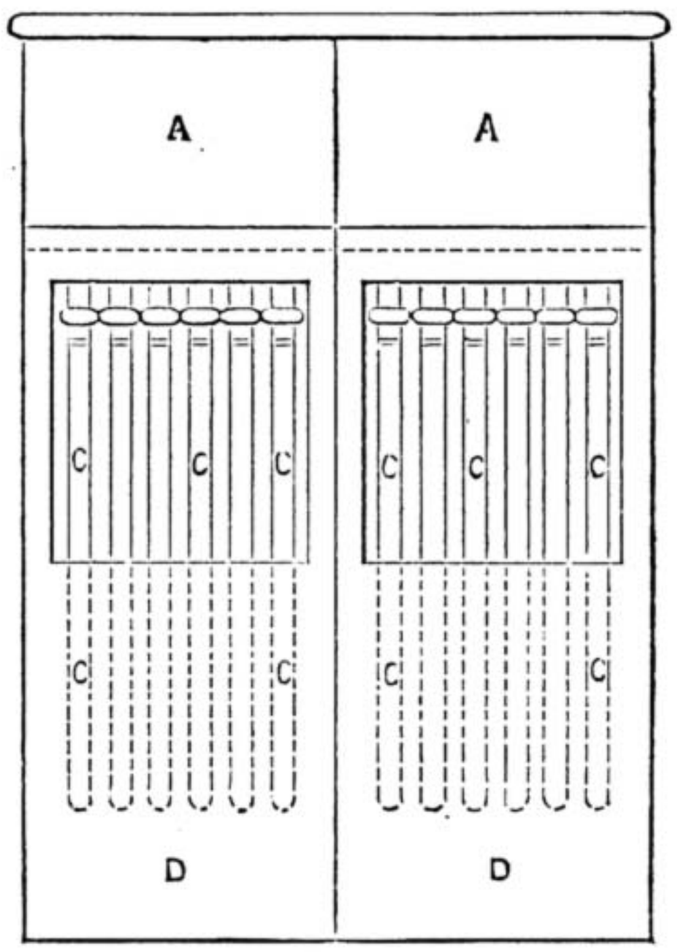
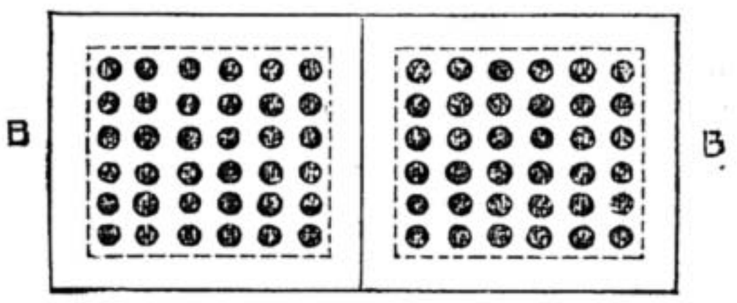


Fig. 2.



Extracting Sugar from Beetroot.

a half tons of roots in two hours. The juice is then forced out of the pulp by hydraulic pressure. Another method is to slice the roots in pieces about the four-hundredth of an inch thick, and to soak these slices in water for some time. In either case, the juice is at once mixed with milk of lime, and boiled by means of a copper coil heated by high-pressure steam. This coagulates and precipitates many albuminous and gummy matters dissolved out with the sugar. The excess of lime is removed by passing a stream of carbonic acid gas through the liquid, which is then run through the bag-filters. This consists of an upper cistern, A, having a perforated bottom, as seen in B. In each hole is fixed a nozzle, to which is tied a cloth bag, C, about 2 feet in diameter, and 6—8 feet long, compressed in a canvas sheath about 5 in. in diameter. Below is another cistern, D, to receive the filtered liquid, which is run off, concentrated to a specific gravity of 25° Baumé, and decolourised by being passed through iron cylinders, 5—10 feet in diameter and 10—50 feet in height, filled with granulated animal charcoal (burnt bones). The clarified syrup is then evaporated down in a vacuum-pan, which consists of a copper or iron vessel, the lower sphere of which is about 2 feet in depth and 7—10 feet in its greatest diameter, and the upper sphere or dome, which is hermetically fastened to the lower sphere, about 3—5 feet in height. The sugar is boiled by means of hot water or high-pressure steam circulating through pipes coiled within the lower sphere of the pan, the steam from the sugar being drawn off by means of pumps and condensation. When the syrup is full of crystals, it is drawn off into the centrifugal machines, which make about 1,000 revolutions per minute, and in which the syrup is forced through the perforated sides of the box, leaving the sugar within. This is washed with liquor without stopping the machine, and then taken out ready for use; the syrup being boiled again, and returned to the machines to get a second crop of sugar, and so on for several times, the remaining syrup being molasses. On an average 100 lbs. of beetroots will contain 10 lbs. of sugar, which is obtained as follows:—

First sugars	5·00	lbs.
Second „	1·50	„
Third „	0·50	„
Molasses	1·50	„
Losses—Sugar in pulp	0·50	„
„ in scums ..	0·35	„
„ lost in filters, etc.	0·59	„
Miscellaneous	0 06	„
	10·00	„

F. B. C.

Gold Lettering.—BONA FIDE.—I do not think any practical worker would answer you otherwise than "Use *japanners' gold size* made by a good firm!" At the outside, half an hour is the longest time it would have to stand before laying on the leaf—some makers' size dries in half that time. It is a good plan to keep a little size—japanners'—in an open vessel; it acquires body, and gives a better gloss when gilded upon. It also gets very thick, but, by the addition of some fresh size, we get working consistency with more body and gloss. Upon such a surface as that you mention, when fine strokes would probably be required, I fancy the fresh article would be best; the "aged" size answers well on black *flatted* surfaces.—F. P.

Imitation Marble.—H. B. (*London, E.*).—I conclude you desire to get a perfectly plain black surface, and not a veined imitation like "black and gold" marble. If you notice a piece of polished marble, or evenly a nicely-enamelled slate imitation, you will find its lustre is more akin to a French-polish gloss than that common to a copal-varnished surface. Ebonising, I am afraid, would not answer by reason of the grain of the wood showing, and, therefore, painting with body colour seems the best course open to you. Your surfaces being nicely glass-papered, give the wood two coats of thin oil paint, made from white lead and common black, with the addition of a little liquid, or paste, driers, and used with *most linseed* oil for *first* coat, but more *turps* for the *second*. Carefully strain the paint each time, and paper with 0 glass-paper between each coat, taking care not to take the colour off the sharp edges of the case. Then when any little places are puttied up and hard, give two more coats, same nature and order as before, but with more body or pigment in them. The grain will now probably be quite hidden; if not, give two more coats—don't stint it, or try and put two coats on at once. You can then finish it with two coats of black *enamel paint*, spread it thinly for first coat, then lightly rub with paper, and give a good flowing coat, but don't "overdo it," and have it "run," or you will get some "veins" of anything but a pleasing kind. Try and get a *method* of doing it—first the recessed and most awkward parts, and finishing with the face or most prominent parts. I hope, for the sake of consistency, your clock case has been *designed* and arranged with a view to finishing as *marble*, and not to look like "carved woodwork" painted! If you have suitable caps to the pillars, I fancy gilding with deep gold leaf would suit them; and if, against the black case, you could finish the pillars imitation "malachite"—a green-veined costly marble—you would get a handsome effect; try it later on, when the marbling papers are published. For the present, bronze them all over, coat with the black enamel, but made to the desired bronze-green shade with raw sienna, or ochre, in oil, so that the metal shows through, and then blow patiently a little of the gold bronze upon them before they are hard. *Finish* the pillars *before* the blackwork.—F. P.

Builders' Measuring Book.—J. R. H. (*Newington*).—There are several different works published annually, dealing with the pricing and measuring of work, and of these I can recommend Atchley's or Laxton's "Builders' Price Book." The *Builder* is the place to look for the latest advertisements of such books. As a worker engaged with one branch of practical building, I can quite agree with you that in plasterers' work there is much that could be beneficially written upon. At present, plastering "pure and simple" appears hardly suitable for WORK, so few readers would care to "rough in" and finish off an ordinary job, even if required, in their own home. Doubtless, our Editor will agree that papers on modelling and fine-casting are branches that would be acceptable to many, and will arrange for their due appearance. If you are young and persevering, I commend *modelling* to you, since many journeymen plasterers have risen to good positions in firms like Doulton's by proficiency and skill in that line. Should you want to thoroughly master "measuring up," you must study mensuration.—F. P.

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Tools, Timber, etc.—A. H. W. (*Newcastle*).—(1) A. H. W. will be able to get any tools he requires of any respectable ironmonger in the neighbourhood, and, in most cases, can see the prices marked in plain figures on the goods in the windows. He need not fear being charged 50 per cent. more than the "professional" if he knows what he wants, and goes to a respectable firm. (2) The only timber merchant I know of in Newcastle-on-Tyne is J. Bowman, 67, Quay Side, and if the quantity of timber A. H. W. wants is too small for him to supply, no doubt he will tell him where best to go, but he must be prepared to plane the stuff himself, as few yards have the convenience of being able to plane a little lot of odd sizes. (3) Mouldings, as used by carpenters, etc., can be had at any timber-yard; fancy patterns from most picture-frame makers. If A. H. W. will write me, I will send him a moulding book free. As regards the suggestions, if A. H. W. will refer to No. 33 of WORK, issued November 2nd, he will find full information as to prices of timber, and how to buy it. Nearly every size is mentioned, and should be kept handy for reference. I shall be pleased to give any further information. —A. J. H.

Photographic Ferns.—W. B. R. (*Manchester*). —"Highway Handbook of Photographic Ferns" is published by Piper & Carter, 5, Furnival Street, Holborn, London, price 1s.—F. J. C.

Cleaning Tin Goods.—IRONMONGER (*London, W.*)—There is only one way that I know of to whiten or clean tin goods that have been discoloured by exposure to atmospheric influences, and that is by means of some polishing material and plenty of labour and "elbow grease." I have had some considerable experience in this line, when younger, having had frequently the pleasure (?) of assisting to clean up the old stock of a large tin room of an ironmonger. If the articles are much discoloured, nothing will ever restore their original lustre, whatever the makers of the various and much vaunted polishing pastes and powders may say. But to make them fairly presentable, I have found nothing to beat the following:—Make a paste of fine whiting and olive oil of about the consistency of thick cream; add a few drops of paraffin oil, take a piece of rag as a rubber, and rub the article to be cleaned thoroughly all over, rubbing very hard and briskly. When this is done, take another rag and well rub all the paste off, getting the article as free from it as possible, then take another rag or duster and some fine dry whiting, and commence to polish. You will find a fairly good polish come up, but your duster will get greasy; keep turning the greasy part in, dabbing the duster in the whiting each time till you have polished the article, and then finish with a chamois leather, with just the least dust of whiting. For tarnished copper goods, proceed in exactly the same way, using crocus and oil first, and polishing with dry rottenstone.—R. A.

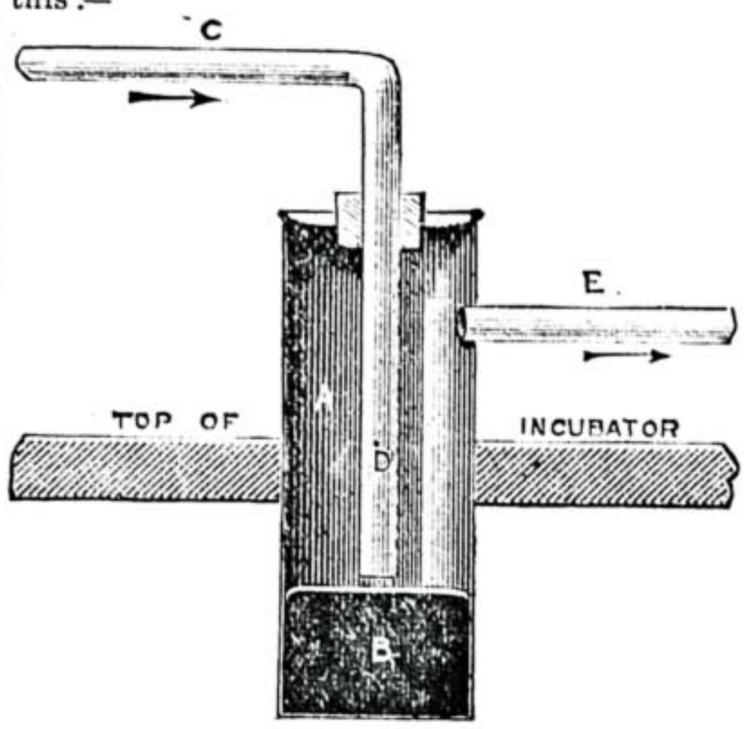
Books on Carpentering.—FROM BURMA (*Kensington*).—The following books may answer your purpose:—Tredgold's "Elementary Principles of Carpentry," 12s. 6d. (Spon); Ashpital's "Carpenter's New Guide," 21s. (Lockwood & Co.); Davidson's "Drawing for Carpenters and Joiners," 3s. 6d. (Cassell); Jewitt's "Manual of Wood Carving," 5s. (Bemrose.)—F. J. C.

Bookbinding.—AN AMATEUR (*Walsall*).—You state in your letter that you have seen from time to time articles and answers on bookbinding. How strange that having seen these you have passed over answers to the two questions which you ask. In No. 17 of WORK, page 269, you will find instructions given for cutting edges of books, which is the best way to make them level. And in No. 24, page 381, you will find a description of one method of marbling edges which is much better than sprinkling. By the way, your method of sprinkling is very handy, but instead of ink use the preparation described on page 269, Vol. I. You might also redden your edges by dipping a sponge in the desired colour (red ink) and drawing it evenly over the edge, taking care not to allow any of the ink to run in to the inside of the book. We are always willing to help querists, but they must be willing to help themselves by looking up their back numbers.—G. C.

Dulcimer Wood.—A. E. G. (*London, W.*)—If A. E. G. will write me through the Editor I will get what he requires for him. Let me know exact sizes and I will get the nearest I can; as I am in the "know," I may succeed better, and forward on through the Parcels Post.—A. J. H.

Bricklaying.—H. G. (*Bow*).—It is not possible within the limited space allotted to "Shop" to give full details of drawing, cutting, and setting arches, but as a general rule, the joints of the arch should be drawn to radiate to the centre from which the arch is struck; a mould is then cut to the shape of the arch bricks, and marked on the face of each brick; the lines are cut in for a short distance by a saw, and the bricks cut by the brick hammer, chisels, and scotch; they are then rubbed on a level stone till they fit the mould. The bricks are set with fine putty, the joints being $\frac{1}{16}$ in. thick, and set to radiate to the centre, by means of a cord fixed to a nail in the centre, or by a template made to fit on the wood centre. A series of articles on bricklayers' work are now appearing, in which the subject is more fully treated. If you want information on any special work, if you send particulars of it, I shall be glad to give you any assistance. I should also advise you to take lessons in geometry and architectural drawing, if you have not done so, as you will then familiarise yourself with plans, and the method of drawing them.—E.

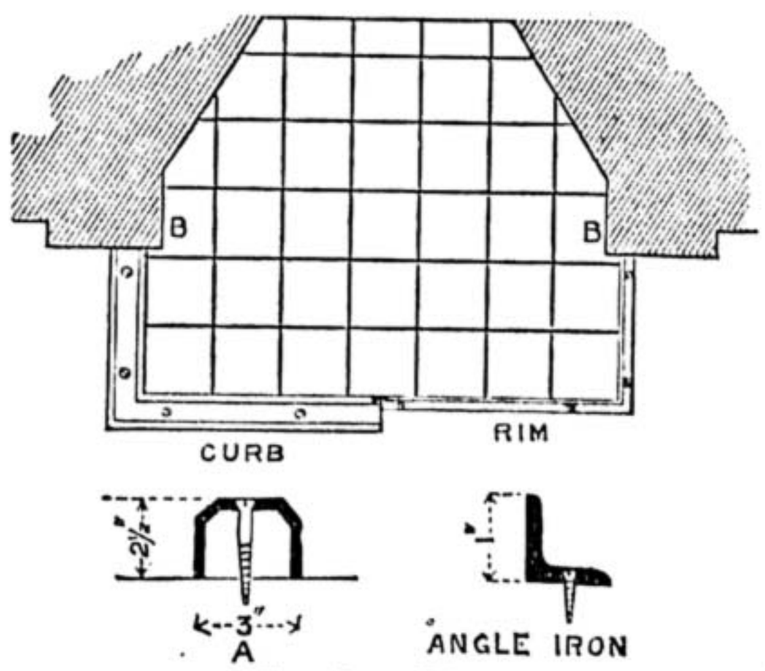
Simple Incubator.—AMATEUR (*St. Helens*).—I should like to say that there is nothing specially new about the incubator, and no patent rights to trouble about. As to the regulator, I believe the arrangement sketched is in principle similar to that in Mr. Hearson's patent. I cannot tell when the patent was obtained, but quite eight years ago. The liquid used is part of the invention, and is, I think, some ether, spirit, or mixture which boils at the required temperature. No doubt AMATEUR is aware that spirit boils at a lower temperature than water, and any intermediate boiling point can be secured by a proper mixture of spirit and water —that is, between the boiling point of strong spirit about 90° and water 212°. If AMATEUR can use gas, he can easily manage the regulator without any bother about patented contrivances; if not, better get an electric bell and a thermometer to make contact at 103°. The gas regulator is something like this:—



A Simple Incubator.

A, air-tight receptacle inserted in the top of incubator near to the eggs; B, mercury; C, gas supply; D, pin-hole, to prevent gas going quite out; E, gas to lamp. When mercury, B, expands gas supply is stopped; C can be adjusted and fixed.—B. A. B.

Fireplace Tiles. — GROCER (*Sunderland*).—Your friend was quite right, the tiles would not keep their place if simply laid on the hearth. When tiles are laid on an existing hearth, it is generally done to save taking up the hearths, etc., and knocking the place about (which would, no doubt, have to be made good at the expiration of your tenancy), and not with the idea of saving the tiles. You would find that the tiles, after having been subjected to the heat of the fire and the wear and tear, were of very little use after being taken up, although the hearth under them could be cleaned and left intact. If you also are not so particular as to saving the tiles, but do not wish to destroy any portion of the house which you might be called upon to make good, the best way to go to work is as follows: —First determine the size you wish the hearth to be (letting the size of tiles influence you as much as possible, so as to avoid more cutting than is absolutely necessary), allow about $\frac{1}{16}$ of an inch for each joint between the tiles, then take a piece of angle iron about 1 in. by 1 in., and bend, or have it bent, to the length your hearth is to be, and



Fireplace Tiles.

the distance out from the jambs. The bottom flange should now be drilled and countersunk for screwing to floor; this will form a strong rim for your hearth. If you wish the tile hearth to be smaller than the existing one, drill small holes in the latter, corresponding to the holes in the iron rim; fill them up with molten lead, and this will give you a strong fixing for your screws. If you think the iron rim would be unsightly, you can buy a japanned cast iron curb or fender to about the section shown at A, and by drilling a few countersunk holes through the top it can be screwed down to the floor as described above. They are very cheap, and can be got to almost any size, and make a very nice finish, for I have no doubt you would find it rather a difficult matter to get anything in the shape of a fender to fit up to the iron rim, and with this latter method you have the fender and rim in one. The small sketch above shows one half of the hearth done with an iron rim, and the other half with a curb. The tiles should be bedded on the old hearth with Portland cement, having at least $\frac{3}{4}$ of an inch bed under them. In cutting the tiles, you simply cut through the glaze on the face of the tile with a small steel chisel about $\frac{1}{4}$ of an inch wide, and then tap them along the line at the back, when you will find they will break quite readily. You must not be disappointed if you break one or two, but try and make them work in for the back. If any of your tiles require a piece taken out of them, as at B, the simplest way is to cut them right through straight across, and then cut the piece off after. You can then replace the piece you want, and the joint will hardly be noticed, if you are careful not to get any cement into it. As you are an amateur, the best way to lay them is to cut and fit all your tiles first; then take them up and lay them in water. Now mix up some neat cement rather soft, and float over the whole of the hearth a little higher than you reckon the bed should be when finished; next lay all the tiles quickly and lightly on the cement, and pat them down evenly to a level surface with a piece of wood, and then any of them that are too low or not low enough, etc., can be picked up with the point of a trowel, and a little bedding added or taken away as the case may be, and the tile relaid. If you now mix up about a handful of stiff cement and with a rag rub it well into the joints, you can then polish the tiles off with a dry cloth.—E. D.

Boat-building.—NOVICE.—Papers on this subject have been already begun in this volume, beginning with canoes.

Taking Out a Patent.—G. W. (*Bournemouth*) does not make the nature of his invention quite clear. If the novelty exists in the shape, pattern, or design, registration, at a cost of 10s., will protect it; but if any mechanical action or principle is involved, it can only (as has been already explained to a previous correspondent) be protected by the more costly patent.—C. C. C.

Camera Bellows. — PHOTOGRAPHER.—Full directions how to make a camera bellows have already been given in WORK. They may be summarised as follows:—Paste together with bookbinders' paste some stout buckram and bookbinders' cloth of sufficient size. The dimensions must be determined by measurement of the frame of the camera to which it is intended to attach it, a little allowance being made for overlap. The length of the material must be two or three inches longer than the required extension to compensate for the folding, and to avoid undue strain. Rule lines, an inch apart, across the width of the material, and from corner to corner, corresponding to the frame, as guides for folding them before the paste becomes absolutely dry, fold the material backwards and forwards according to the lines, and put under pressure so folded till dry. Pull out the material straight and make sharp creases along the lines drawn from corner to corner, the buckram being inside; bend the first creases at right angles with the latter. Pinch up the corners smoothly with the finger and thumb, and glue the overlap to complete the bellows. It is as well to make a paper pattern first to accustom oneself to the folding, as experiments cannot be made on the pasted material without spoiling it.—D.

Electric Lighting.—C. V. M. (*London, S.W.*). —I advise you to have nothing to do with an apparatus for lighting a 55 volt 32 c.p. "Ediswan" lamp. If you want to get a light of 32 c.p. from incandescent lamps, get four 8 c.p. lamps and group them in parallel. Read my articles on "Model Electric Light" when they appear, and then you will be able to judge for yourself respecting the cost of apparatus necessary to light up one 55 volt 32 c.p. lamp, as also how to set about getting the electric light required by you. I may tell you, however, that a 55 volt lamp will not need an E.M.F. of 120 volts to light it properly.—G. E. B.

Pipe-Lighting Plane.—J. P. (*Reigate*).—The plane for making pipe lighters curled up like a twisted paper spill has already been fully described and illustrated in No. 30 of WORK, page 468. This description, written by J. H., and having three illustrations of this particular plane, must have escaped the observation of J. P. If, however, he does not quite understand how to make the plane from the description given, or feels uncertain as to his probable success, he can get a plane for the purpose at Preston's, Pentonville Hill, at a very cheap rate. The plane they sell is made of iron, and is suitable for either amateurs, tobacconists, or others who may desire or require these lighters for themselves or others.—B. A. B.

Copying Apparatus.—J. R. H. (*Newark*).—To use the graph copying apparatus, all you have to do is to write with a special ink in the ordinary way. Allow the ink to dry without using blotting paper. Then lay the paper with the writing in contact with the graph, smoothing it down carefully to avoid smears and wrinkles. Allow the paper to remain for a minute or two. On raising it you will find the jelly has taken an imprint of the writing or drawing, which will be transferred to any sheet

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of paper pressed down on it and allowed to remain for a few seconds. As you will have seen elsewhere if you read these columns, it is not possible to give answers in "next week's 'Shop.'"—D. A.

Bevelled Glass.—R. T. H. (*Chatham*).—The price of glass per foot depends on the size of the plates, but unless any of them are very large you may reckon them as costing from 2s. to 3s. per foot super. Cost of bevelling varies according to the width of the bevel; you may reckon it as from 6d. to 1s. per foot run. Price will also be regulated by quality of glass, silvering, and bevelling. You can get the plates by ordering them through any good cabinet maker.—D. D.

Oil Fuel.—J. M. (*Ayr*).—The information you ask for cannot be given in these columns, as so much depends on circumstances. You should consult an engineer who could personally examine the boiler and its fittings.—L. J. P.

Colour Box.—A CONSTANT READER (*Leicester*).—I do not know that I can better help you to make a box to hold oil colours in tubes and other sundries than by describing it as a tray with a lid. The tray is to be divided into compartments by partitions of thin wood. The compartments of course will vary according to the sizes of the tubes, as though you only state one size, I presume you would not think of getting large tubes of the more valuable paints. As you are going in for a quantity, or, perhaps I should say, have got them already, mark out on a sheet of paper the full size of the spaces necessary. You will then have no difficulty in arranging the compartments in your box accordingly. I do not understand the part of your letter referring to palette, brushes, etc. Surely you do not contemplate starting to landscape work without any knowledge of painting. If you already can make use of about forty colours, you must have made some progress in the art, and do not require to be told among other things that brushes are a great deal a matter of custom and fancy, that size depends on the class of work, size of canvas, and so on.—D. A.

Type-Writing Machine.—A. J. M.—I am afraid no directions for making a type-writer are likely to appear in these pages for the simple reason that machines of this class are complicated contrivances, and that any one inventing new or improving on old forms is more likely to patent than to explain how to make. At present all the best machines are protected by patents, but even were this not the case, I am inclined to think that it would not pay you to make a single machine, as they are produced by machinery and require the utmost nicety of construction in every detail. The prices of good machines, that is those with which rapid work can be done, are high. As you do not care to incur the necessary expense for a new machine, why not buy a second-hand one? They are constantly being advertised in the *Bazaar Exchange and Mart*. A cheap rapid writing machine called the "Mercury" is in preparation, and as its price will only be £8 8s., or less than half that of any of the best keyboard writers in the market, it may suit you. Glad to hear you like WORK so much.—D. D.

Modern Beehives.—AN AMATEUR WORKER (*Dorking*) has quite a treat in store for him, for not alone are beehives and their construction to be described, but all the other apparatus necessary for the apiary. Space is the only commodity necessary, as most of the papers are already in the Editor's hands, and the others have appeared already. From the tone of AMATEUR WORKER'S letter, I would recommend him to send eighteen pence to Messrs. Houlston & Sons, Paternoster Row, London, for a copy of Mr. Cowan's "Bee-Keeper's Guide Book," which will reveal a new world in bee-keeping to him. With regard to the label he asks for, I can quite sympathise with him, but, unfortunately, cannot name a publisher. However, such a small thing would scarcely require a "publisher," as any printer would supply a few hundreds for a shilling or two, and then the name could be printed as well as the rest, and perhaps some original verses descriptive of the weakness of those people's memory who do not return books.—APIS.

Milling Cutters.—W. F. (*Manchester*).—Heat the cutters in a clear smith's fire, made hot by the blast, but cease blowing at the time of heating up the cutters. Plunge the cutters, when red hot, into oil to harden them, preferably using sperm oil. Then brighten them all over, and heat in a sand bath. The bath may consist of any fine sand, and should be heated with gas jets underneath. This will impart a very equable and easily graduated temperature to the cutters. When of a straw colour plunge in water to temper. The speed of course depends on the material. Roughly, you can use milling cutters at from two to two and a half times faster than ordinary cutting tools for turning and planing.—J.

Brass Pattern Making.—W. G. R. (*Bilston*).—This is purely a business, not a technical, question. Obviously, the only way to get trade is to canvass personally with samples, or to advertise, or to combine the two methods. And to get the names of leading firms you have only to consult the directory, or to spend a day or two about the town.—J.

Drawing.—J. S. (*Glasgow*).—This subject is one which does not come within the scope of WORK.

Steel Springs.—(NO NAME).—Get a round mandrel of the same diameter as the internal portion of the coil, drill a hole near one end, insert one end of the wire or rod from which the spring is to be made, and then set the bar in the lathe, and turning slowly, coil the wire or rod around the mandrel. To harden, heat to blood red, and quench in water. To temper, heat slowly until tallow or oil placed upon the spring burns or flashes off. At that heat remove from the fire.—J.

Model Locomotive.—H. P. S.—Your boiler dimensions being fixed, your heating surface is fixed also. A force pump of $\frac{1}{16}$ in. diameter, and the same stroke as engine, and cylinders of $1\frac{1}{8}$ in. bore, and from $1\frac{1}{4}$ in. to $1\frac{3}{4}$ in. stroke, would be suitably proportioned for your model.—J.

Linoleum.—J. E. (*Liverpool*).—To give "all particulars" about the manufacture of linoleum in "Shop," or even in the Magazine itself, is out of the question. To do so would probably not be of interest to many, and certainly not useful to any of our readers. There are limits to the things which even the most ambitious amateur could make, and linoleum is outside these limits. It cannot be made profitably without a considerable preliminary outlay, and it would never pay you to attempt to make a small quantity. The "cheapest way" to get linoleum is to buy it. An outline of the process may be given thus. Specially prepared linseed oil is mixed with ground cork. The mixture is then laid on canvas, and evenly distributed by pressure. The back of the canvas is then finished by painting. If you are still disposed to make an attempt to manufacture, you will probably get a very bad substitution for or imitation of the real thing at greater cost than you can buy the best linoleum for.—D. D.

Early English Sideboard.—T. M. (*Glasgow*).—As you will see if you will refer to our back numbers, your wants have been anticipated. Designs for other sideboards will be given in due course. There is nothing special about the Beith work, except that makers there have a reputation for good honest work. As you are a cabinet-maker, though apparently only familiar with common stuff, I may be permitted to suggest that you should try and get into some good shop. If you are a young man go as improver, but if you are too old to do so, you might still manage to get in, though not as a fully-skilled artisan. If you do go as an improver, and really wish to progress, do not make a very common mistake and fancy after a month or two that you are worth as much as any one else, and that you have nothing more to learn. I know a manufacturer who, two or three years ago, having numerous applications from young men wishing to enter his employment as improvers, determined to try the experiment of "improving" them. I regret to say his experience has not been of the most satisfactory character, as so many of the lads think they know much more than older people, and have large ideas of their own value. These remarks may be of use to you in showing what employers do not like. If you are inclined to remove from Scotland and wish to improve, I may be able to tell you of a shop in England where you might get employment. Before I can do so, however, you must let us know full particulars of where you have worked, and what you can make. You need not write a page or two to say that you are sober, honest, and possessed of all the other virtues. If you are not say so. Meanwhile, read all the articles which have appeared in WORK in connection with cabinet-making and joinery.—D. D.

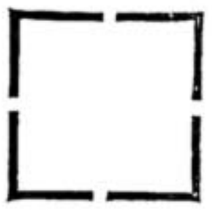
Books on Locks.—A. M.—All the best makers have books descriptive of their particular locks, but I do not know of any book dealing specially on the subject you mention.—T. W.

Coloured Plates.—KNARF (*Lower Broughton*).—We cannot at present go into coloured plates such as you suggest in connection with WORK.

Electro Motors.—PLEASURE AND PROFIT.—Electro motors of different types are described in the text books of electricity and magnetism, and cannot be described in a brief reply. Neither can a model horizontal engine, which can only be properly treated in several articles.—J.

IV.—QUESTION ANSWERED BY A CORRESPONDENT.

Wood Mitre Cramp.—J. A. (*Keighley*) writes in reply to J. H. (*Blackburn*) (see page 605, Vol. I.):—"The most easy way to make a cramp of wood is by four half squares. Place them at the corners, and then bind them with a piece of strong twine after your suggestion. You will find it to act well and firm."



Wood Mitre Cramp.

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—LONG CRANK; A. O. W. (*Ripon*); F. U. (*Hereford*); QUANDRY; C. F. (*Southsea*); CURLY; TINMAN; J. M. (*Middlesboro'*); G. A. P. (*Stoneycroft*); N. M. (*Norwich*); J. K. (*Market Weighton*); CONSTANT READER (*Hull*); AMERICAN ORGAN; C. H. W. (*Highbury*); PLUMBER; T. W. A. (*East Dulwich*); £ S. D.; IRIS; W. H. O. P. (*Hackney, N.E.*); BREMNER (*Llanelly*); A. W. (*Wakefield*); READER OF "WORK"; A. H. T. (*Brierfield*); V. B. (*Birmingham*); JACK (*Edinburgh*); AMATEUR; T. T. (*Northampton*); S. B. (*Nottingham*); W. S. W. (*Greenock*); A NEW READER OF "WORK"; J. W. (*Holloway, N.*); ANXIOUS ONE; AMATEUR (*Fife*); P. R. (*Sunderland*); WORKIST; F. H. (*Streatham Hill*); H. J. (*Bromdesbury, N.W.*); C. A. (*Westbourne Park*); M. E. M. (*Henwood*); J. J. (*Kidderminster*); C. M. G. (*Belfast*); THE BRITANNIA CO.; H. M. (*Bristol*); G. T. P. (*Birmingham*); P. R. P. (*Newcastle-on-Tyne*); OILSTONES; TIMBRE; A. G. (*Newcastle-on-Tyne*); M. E. (*Birkenhead*); E. J. (*Stoke Newington*); AMATEUR CARPENTER (*Dublin*); A. R. (*Sandgate*); W. J. S. (*Paddington*); D. G. T. (*Cornhill*); J. R. W. (*Portsmouth*); W. A. Y. (*Cambridge*); PATIENCE; A CONSTANT READER OF "WORK;" C. E. (*St. Pancras*); A YOUNGSTER; INDEX; FITTER; R. H. (*Bradford*); C. W. (*Kensington*); DIAMOND MOUNTER; T. D. (*Bury*); T. D. B.; J. R. (*Huntley*); HERR VON MUTZ; J. S. (*Aberdeen*); STATIONER.

Trade Note.

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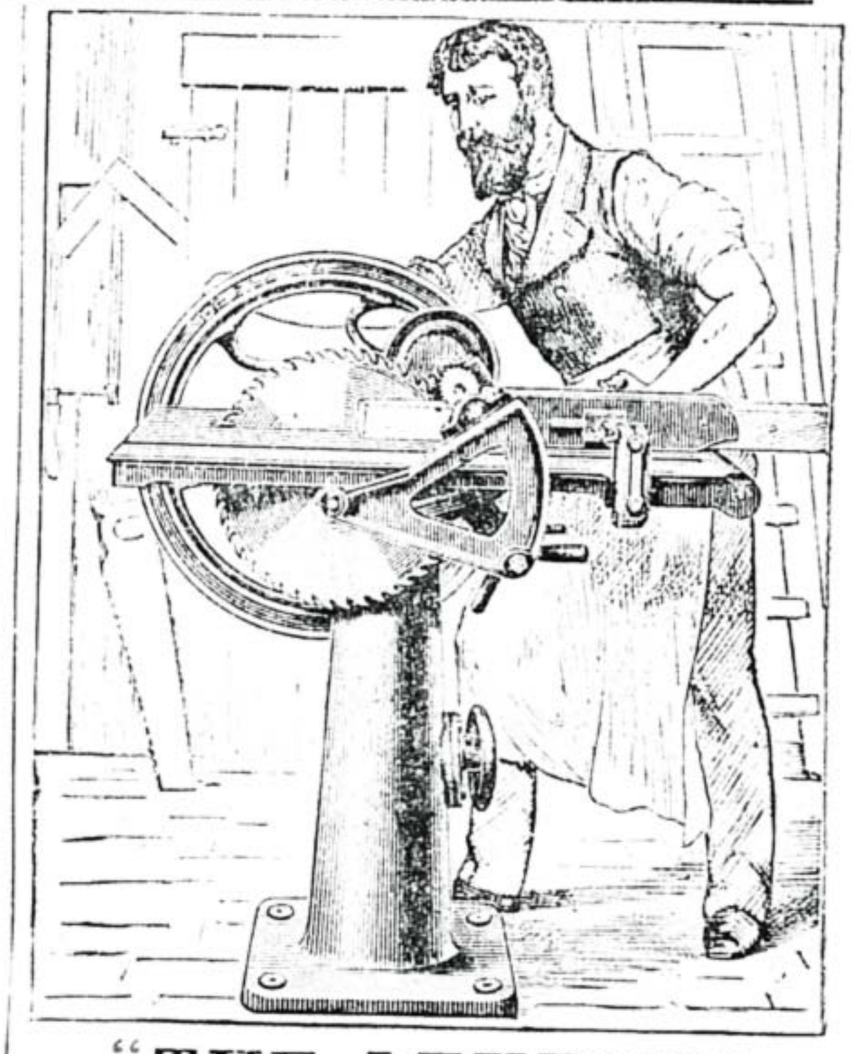

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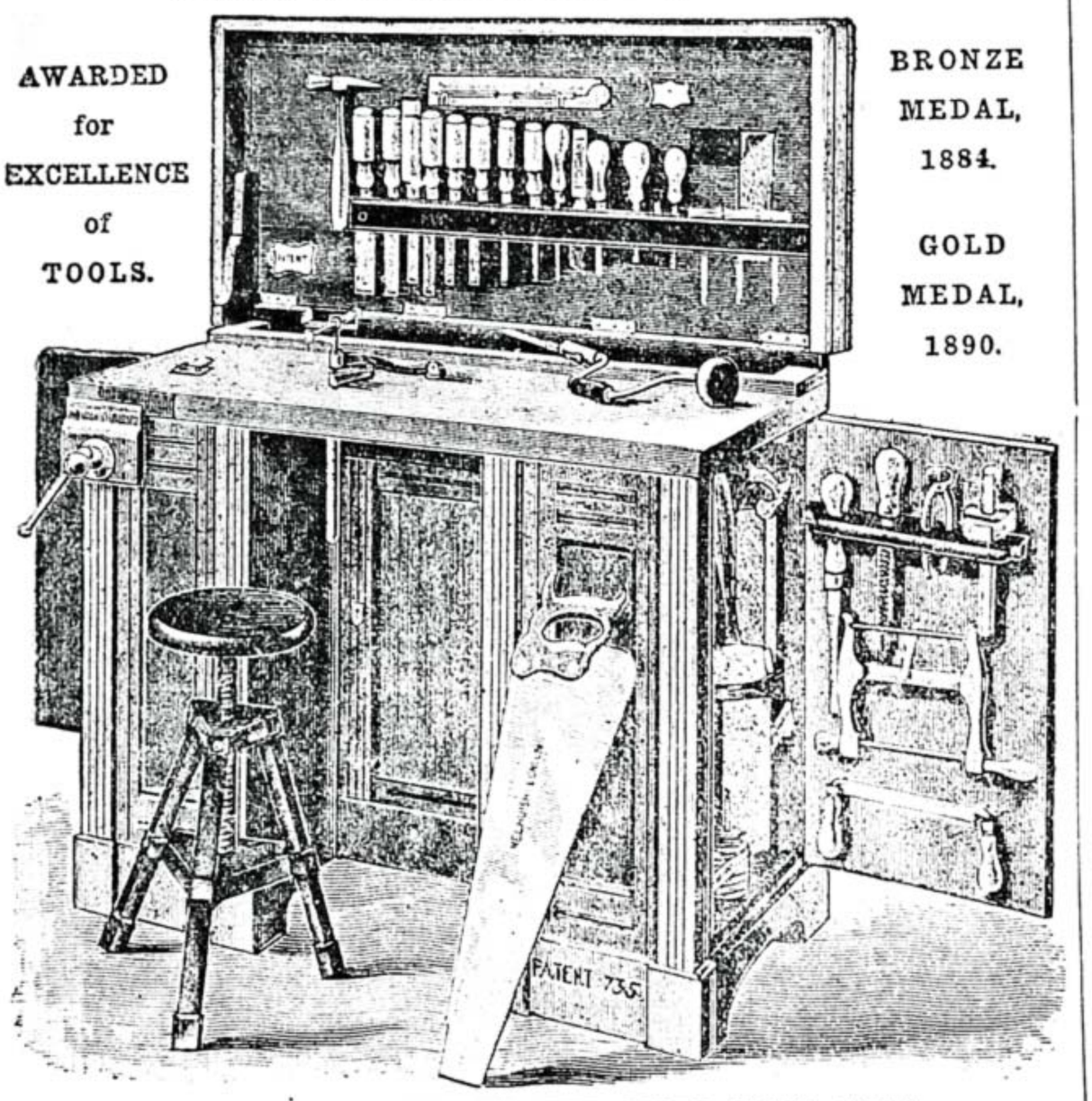

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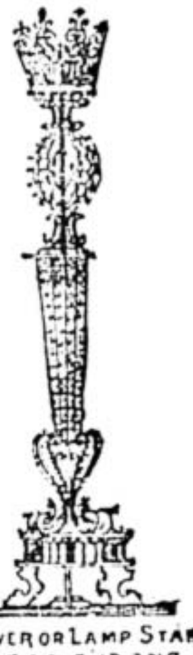

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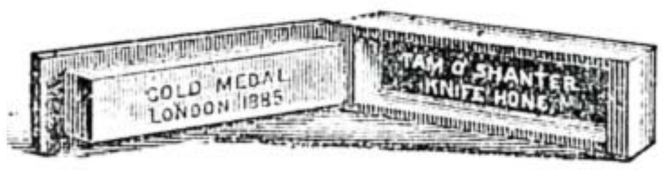

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